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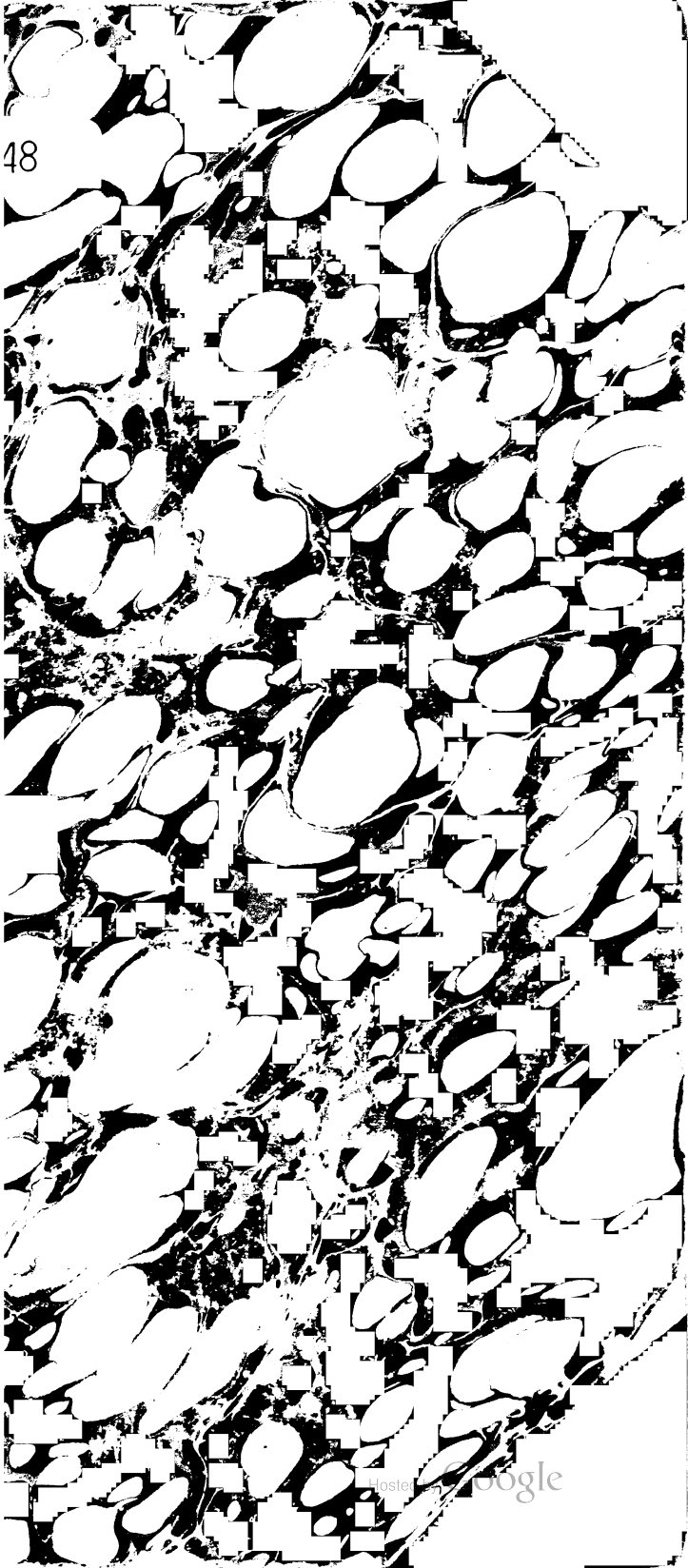

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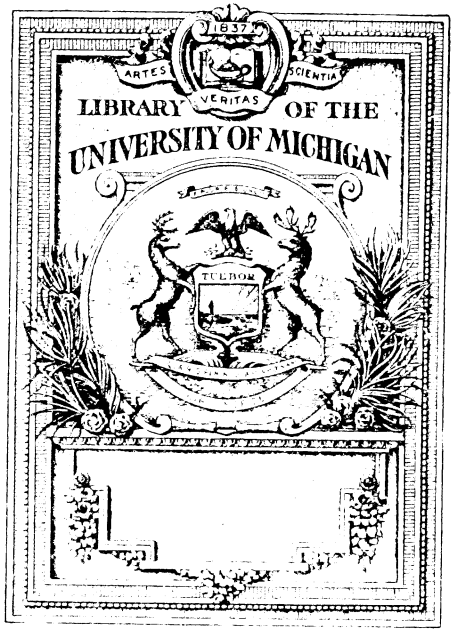

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

SEVENTH COMMUNICATION ON THE BATTERY WITH TWO LIQUIDS.—ON CHEMICAL ACTION.

BY M. C. DESPRETZ.

I. In the several commuications on the battery which I had the honor of communicating to the Academy in 1849, I think that I have proved beyond dispute the general fact that all bodies are fusible and volatile. [See THE CHEMIST, New Series, Vol. I. (1849-50) pp. 195, 239 and 296.]

I say *all* bodies, because I have fused all those which I experimented on, as baryta, strontia, lime, magnesia, oxide of zinc, tungsten, titanium, iridium, boron, silicium &c., and the charcoal resulting from the diamond or well-crystallised and colorless sugar candy. I do not mention silica and alumina, although I fused them with the greatest ease, because M. Gaudin had already fused them with his sidereal flame. I have likewise ascertained that all these bodies, as well as platinum, iron, oxide of chromium, &c., are most evidently volatile.

It is remarked that at these elevated temperatures the silicates abandon, in fusing, at once, the most volatile matters, potassa or silica, according to circumstances. I shall return to this point.

No doubt seems to have been expressed concerning the correctness of the general fact which I have established by experiment: one point alone has given rise to any uncertain ty.

As I have insisted, in several communications, that the fused plates and small globules which I obtained with the purest porous charcoal had all the properties of graphite, some persons seem to have thought that I gave as a discovery the conversion of charcoal into graphite, whilst I insisted only on the fusion of pure charcoal, which no one before me had effected, and on the circumstance that the fused charcoal in plates or in small globules was soft, like graphite; it was expected that it would be found as hard as the diamond.

I could not publish the production of graphite as a new thing. More than twenty-five years ago, M. Dobereiner obtained graphite with a mixture of charcoal and iron, heated to the highest degree of a furnace. (Schweigger's Journal, vol. XXV.) MM. Fizeau and Foucault, M. Bunsen, and every one who has repeated Davy's experiment, had proved, before I undertook my experiments, that the points of retort charcoal are converted into graphite in that beautiful experiment. It was also known that the coke withdrawn from retorts, often presents, where it has been in contact with the sides, very considerable portions with all the characters of graphite.

It was known therefore, long prior to my experiments, that charcoal may, by a molecular modification, acquire, without change of state, the properties of graphite; but the fusion of charcoal was not known, nor was it known that fused charcoal is graphite.

II. In my fifth communication [See THE CHEMIST, New Series, Vol. I. (1849-50) p. 383,] I related the following facts:—

In a battery arranged end to end, the vertical arc increases more than proportionally to the number of the elements, and less than the same number arranged for quantity. The horizontal arc, *ceteris paribus*, has the greatest length when the direction of the current is east and west; the vertical arc is also longer when the positive pole is above and the negative below.

III. The principal results of my sixth communication, [THE CHEMIST, New Series, Vol. II., (1850-51) p. 49, are:—

1. That the position of the rays in the spectrum of the light furnished by a voltaïc battery, is independent of the intensity and energy of the battery, or, in other terms, of the number and size of the elements. M.

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Masson has ascertained, since my communication, that it is the same with the spectrum furnished by static electricity.

2. That the intensity of the electrical light increases feebly with the number of elements placed end to end, and that this intensity increases nearly in proportion to the extent of the elements, the number of elements remaining the same.

3. That in a Bunsen's battery with two liquids, it is not advantageous to exceed the number of eight elements when the battery is employed for producing a chemical effect.

IV. In the last communication I have already had the honor of calling the attention of the Academy to the chemical phenomena of the battery. I now return to this subject.

I have made a very great number of experiments on the comparison of the internal chemical action with the external chemical work, that is to say, on the comparison of the zinc dissolved in the battery with two liquids, with the water decomposed by the current.

The battery with two liquids is here spoken of, for experiments with the single liquid battery were made fifteen years since.

The law of chemical decompositions determined by the passage of the voltaïc current into a compound liquid, and which science owes to Faraday;—the later researches of M. E. Becquerel, and those of Matteucci, &c., on this important subject, are given in all the books. In these various works, and in others of the same kind, the elements separated by the current alone have been compared.

Daniell, who has given his name to a battery frequently employed in the arts, was the first, I think, who saw that in a battery of platinum and amalgamated zinc, there is disengaged as much hydrogen on the platinum of each pair as in the external Voltameter. (Philosophical Transactions, 1836. Letter to Faraday.)

Mr. Grove has ascertained that, in his gas battery, the volume of gases arising from the water in the voltameter is equal to the volumes of hydrogen and oxygen which disappears in each pair. (Philosophical Transactions, 1843.)

M. Pouillet states, in his *Physique*, 4th edition, Vol. I. p. 782, that MM. Boquillon and Silbermann have proved that, in a Smee's battery, the weight of hydrogen disengaged on the platinum is to the weight of the copper deposited on a mould placed at the negative pole and covered with a solution of sulphate of copper, in the ratio of the equivalent numbers of these two bodies, which agrees with the fact first mentioned by Daniell.

I have recapitulated the various researches on the battery with one liquid, the oldest of which, those of Daniell, date from 1836, although all the numerous experiments which I have made relate to the battery with two liquids. In this last instrument, more complex actions must bring forth results also more complex.

V. I have endeavoured to take proper precautions for ensuring the success of the experiments. The elements—the voltametus being previously dried with hot cloths—were placed on plates of glass varnished with gum lac or on waxed cloths, whose bands do not permit even the statical electricity to pass away*.

If we contented ourselves with leaving the battery, as has very often been done, in the wooden cases in which it is ordinarily contained, the isolation would be very imperfect and all the electricity developed would not arrive in the liquid to be decomposed; there would be as we say in mechanics *a portion of the force lost.* The external work would be more or less below the internal work. Even with all the precautions pointed out the success of the experiments would be very uncertain, if we operated in the open air, at least unless the temperature were very low. for instance 4 or 5 degrees below the freezing point, or unless the air were very dry.

At a low temperature, I obtained in a shed, very concordant results; but when the temperature rose and the hygrometer approached towards extreme humidity the results have been rejected and the experiments recommenced in a closed apartment maintained at a temperature rather higher than that without.

The voltameters were funnels containing about 1 litre (quart) of liquid (9 parts water and 1 part sulphuric acid by measure) the two platinum wires were kept in separate glass tubes covered with mastic at the bottom of the funnel. To the lower extremity of each wire was soldered a plate of copper dipping into a glass covered with a varnish of gum lac, and partly filled with mercury; one of the glasses received the positive electrode and the other the negative electrode. The diameter of the platinum wires was 1·2mm., the length in the acidulated water was 87·7 mm.; the distance of 6·7mm. ; the glasses

* Among the physicists who have endeavoured to obtain the complete isolation of the battery, Mr. Gassiot must in particular be mentioned. (Phil. Transactions, 1844.)

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and funnels rested on very dry wood. The graduated tube, of 1 metre in length, of the capacity of rather more than one pint; this tube covered the negative wire, so that only the hydrogen was collected, the hydrogen being disengaged into the air through the water.

I should have been able to collect the two gases in the same receiver; I ascertained that there was no absorption. That is to say, that we arrive at the same quantity of water decomposed as we collect of hydrogen or the two gases united. It is well understood that in these last experiments, as, moreover, in all the others, the wires were entirely covered with the liquid to be decomposed until the end of the experiment.

In order that I might not have to fear the effect of the presence of a certain quantity of oxygen remaining on the positive pole from any cause whatever, I always used the same wire for the hydrogen.

VI. I will make a few remarks before detailing the results.

Amalgamated zinc, which is generally regarded as not being attacked by dilute sulphuric acid, nor by a solution of common salt, is however, so attacked in an appreciable manner.

This action must not be attributed to the nitric acid present in the sulphuric acid, for perfectly pure sulphuric acid likewise produces it. Besides, we did not use sulphuric acid until we had ascertained, by the delicate process of M. des Bassins de Richemont, that it contained none, or infinitely small, and consequently unimportant traces of nitric acid.

When the experiment is made with the battery, without the current existing, there would be reason to fear the passage of a small quantity of nitric acid, by endosmose, or otherwise, into the porous vessels; but in separate glass vessels, there is absolutely only sulphuric acid and water, and yet the amalgamated zinc dissolves in small quantity, the zinc of commerce as well as zinc purified by distillation. This solution is effected in acid diluted with 2, 4, 9, 18 or 36 times its bulk of water.

By the loss of weight, or by the volume disengaged, it is ascertained that the gas produced without the assistance of the electric current does not constitute the $\frac{1}{406}$ of the gas disengaged in one of the experiments reported; which is below errors unavoidable in such experiments. We here speak of the solution of 1 volume of acid and 6 volumes of water.

No mercury is dissolved in the chemical phenomenon of the battery, for if we pass a current of sulphuretted hydrogen into the acid sulphate of the porous vessels previously diluted with water, no perceptible precipitate is formed.

EXPERIMENTS WITH BUNSEN'S BATTERY.

VII. First Experiment. Nine elements; 1 voltameter; hydrogen gas disengaged 0·5935 lit.; temperature 60° F.; pressure 0·7559m.

The elastic force of the vapor of the acid diluted with 9 volumes of water was equal to 832mm.=f.*

The volume of gas disengaged brought to 32° F. in the dry state, at 0·76m. became 0·5647lit.

The total quantity of zinc dissolved in the experiment was 15·02gr., or of each element 1·669gr.; which corresponds to 0·5702lit.

The difference is 00.055lit., or about $\frac{1}{104}$ of the total volume.

Second Experiment.—Six elements; two voltameters; gas disengaged in one voltameter 0·5605lit.; temperature 51° F.; pressure 0·7466; elastic force of the vapor 8·73mm.

Volume of the dry hydrogen gas at 32° F. and 0·76m., 0·5253lit.

Total zinc dissolved, 9·16gr., or 1·526gr. for each element; which corresponds to 0·5335lit. of hydrogen.

Difference 0.0082, or about $\frac{1}{66}$ of the total; volume disengaged.

Third Experiment.—Nine elements, 3 voltameters; gas disengaged, 0·5643lit., in one voltameter; temperature 51°·4 F.; pressure, 0·770m.; f=8·9mm.; volume dry at 32° F. and 0·76m.=0·5438lit.

Total zinc dissolved 14·38gr., or 1·5977 for one element, which is equivalent to 0·5461lit. of hydrogen: difference 0.0023lit., or $\frac{1}{237}$ of the total volume. This experiment gave, for the nitric acid battery, the smallest difference between the internal and the external work.

VIII. To ascertain if more approximate results could be obtained, I charged the whole Bunsen's battery with sulphuric acid diluted with 9 volumes of water.

I had previously steeped the pots and charcoals for several days, and I changed the water many times, even after it had ceased to redden litmus paper: I thus removed, I think, all traces of nitric acid.

* I did not determine directly the elastic forces of the vapor. I arrived at them with the curves which I traced with the numbers given by M. Regnault in his Memoir on hygrometry. (Annales de Chimie et de Physique, 3e Série, tome XV.)

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I will give the details of an experiment made in these conditions.

Three elements; one voltameter; hydrogen gas disengaged, 0·5685lit., temperature, 49°·55 F.; pressure 0·7695; f=8·29mm.

Volume dry at 32° F., and 0·76m.= 0·5494.

Total zinc dissolved 4·89gr. or 1 element 1·62gr., which is equivalent to 0·5538lit. of hydrogen: difference in the same direction 0·0044lit., or about $\frac{1}{125}$ of the total volume disengaged; duration, 4h. 43m.

This experiment with Bunsen's battery charged only with sulphuric acid diluted with 9 times its volume of water, and other similar experiments which I do not detail, show that this battery, thus arranged, requires for the performance of a certain amount of work about five times as much time as the same battery charged in the ordinary manner.

In this experiment there was no nitric acid; there was however, a very small difference.

These experiments are sufficient, I think, to prove, that in the battery with two liquids and with nitric acid, the external work is represented, in general, about $\frac{1}{100}$ less than the internal.

It will readily be admitted that this consequence is applicable to the first nitric acid battery, that of Grove, in which Bunsen has replaced platinum by charcoal.

EXPERIMENTS WITH DANIELL'S BATTERY.

IX. The elements with which I made these experiments were of ordinary dimensions; they were kindly lent to me by M. Hulot, who is connected with the Mint of Paris, and who is well known for the beautiful products which he has supplied to the Bank and Post Office.

I employ the same flat zincs as in the first part of this memoir. Thus, the solution of common salt in the Daniell's battery and the dilute sulphuric acid in the Bunsen's were of the same height.

The jars containing the copper were filled with a solution of sulphate of that metal, saturated at the temperature of the apartment. Some crystals of sulphate of copper were put in as usual, in order to maintain an uniform degree of saturation.

The common salt which was used in our first experiments with Daniell's battery was furnished by our colleague, M. Balard: it was nearly pure.

FIRST EXPERIMENT.—The solution of common salt in the porous vessels contained 9 parts of water and 1 part of salt by weight.

Six elements; 1 voltameter; gas disengaged 0·5818lit.; temperature 56°·3 F.; pressure 0·7609m.; elastic force of the vapor, 10·64mm.; dry gas at 32° F. and 0·76m., 0·5475lit.

Total zinc dissolved, 9·55gr.; for 1 element 1·591gr., which corresponds to 0.5448 lit. of hydrogen.

Difference 0·0027lit. more, or about $\frac{1}{202}$.

SECOND EXPERIMENT.—Six elements; 1 voltameter; gas disengaged 0·5839lit.; temperature 59°·9 F.; pressure 0·7617m.; elastic force 12·17mm.; dry gas at 32° F., and 6·76m. 0·5463lit.

Total zinc dissolved 9·5gr.; for 1 element 1·583gr., which corresponds to 0·5410 lit. of hydrogen.

Difference 0·005lit. more, or about $\frac{1}{102}$ of the total volume disengaged.

In this experiment, the solution of common salt was composed of 5 parts of water and 1 part of salt by weight.

The sulphate of copper of the preceding experiment had been mixed with fresh sulphate.

Duration of the first experiment, 4h. 43m.; of the second, 4h. 22m.

These experiments have the influence of the quantity of salt in solution in contact with the zinc. With nearly double the quantity of salt, the time was reduced to half.

THIRD EXPERIMENT.—Arranged like the foregoing.

Six elements; 1 voltameter; gas disengaged, 0·5866lit.; temperature, 59°·9 F.; pressure, 0·7617m.; elastic force of the vapor 12·17mm.

Dry volume at 32° F., and 0·76m., 0·5476lit.

Total zinc dissolved, 9·72gr.; 1 element 1·62gr., which corresponds to 0·5538 lit. of hydrogen.

The difference was 0.0062lit. less, or about $\frac{1}{88}$ of the total volume. The mean of these experiments would give 0·0018 lit., or about $\frac{1}{300}$ of the total volume of gas disengaged more of the corresponding volume of zinc dissolved, an insignificant difference in experiments of this nature.

FOURTH EXPERIMENT.—Twelve elements; 2 voltameters; gas disengaged, 0 5888lit.; temperature, 60°·8 F.; pressure, 0·7639m.; elastic force, 12·5mm.; dry gas at 32° F., and 0·76m., 0·5494lit.

Total zinc dissolved, 19·48gr.; for 1 element 1·623gr., which is equivalent to 0·5548lit. of hydrogen.

Difference, 0.0054, or about $\frac{1}{103}$ of the total volume disengaged.

FIFTH EXPERIMENT.—Thirty elements;

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5 voltameters; gas disengaged, 0·5395lit., temperature, 56°·21 F.; pressure, 0·747m., elastic force, 10·6mm.; dry gas at 32° F.; and 0·76m., 0·4952lit.

Total zinc dissolved, 43·78gr.; for 1 element 1·459gr., which corresponds to 0·4986lit. of hydrogen.

Difference, 0·0034lit., or about $\frac{1}{146}$.

A sixth experiment, performed in the same way as the fifth, gave an almost identical result.

Experiments made with 6 elements and 1 voltameter, 12 elements and 2 voltameters, and 30 elements and 5 voltameters, decomposed the same quantities of water for the same quantity of zinc dissolved; only, it must be observed that the second arrangement performs in the same time twice as much work as the first, and the third, five times as much.

X. The experiments detailed in this Memoir prove sufficiently, unless we are mistaken, that in the battery with two liquids, *the internal chemical work is equivalent to the external chemical work.*

The external chemical work in any battery is represented by the zinc dissolved in the interior of the instrument.

The difference is so slight that it may be attributed to perturbatory causes difficult to be completely guarded against in all experiments with the battery, whatever may be its arrangement.

The slight discordance which the nitric acid battery presents may have its cause in the zinc dissolved without the aid of the current, in the nitric acid which passes into the sulphuric acid through the porous vessels, in the losses of electricity, notwithstanding all the pains taken to avoid them.

Nitric acid, (density 1·32) and sulphuric acid diluted with 9 volumes of water, (density 1·11) have little tendency to give rise to the phenomenon of endosmose. Nevertheless, traces of nitric acid penetrate into the sulphuric acid, as we have ascertained, by saturating with baryta the acid sulphate of zinc of the porous vessels, according to several experiments made with 4 elements whose porous vessels and charcoals had been steeped for a long time in ordinary water and in distilled water.

The sulphuric acid was diluted with 9 volumes of distilled water.

The nitric acid, in these same experiments, did not appear to be charged with sulphuric acid, for it was not precipitated either by nitrate of baryta or by chloride of barium.—*Comptes Rendus*, No. 7, Aug. 18, 1851.

PRODUCTION OF PURE HYDRATE OF BARYTA FROM CARBONATE OF BARYTA UNDER THE INFLUENCE OF SUPERHEATED STEAM.

BY M. V. A. JACQUELAIN.

I HAVE been enabled to demonstrate by accurate experiments that the carbonates of potassa and soda lose a cousiderable quantity of carbonic acid when, heated to dull redness, they undergo at the same time the action of a current of superheated steam or carbonic acid.

These facts being well established, it was important for me to obtain the complete decarbonisation of these two salts in the presence of superheated steam, for, this reaction being verified, it would become very probable that I should be able to realise a phenomenon of the same order with regard to carbonate of baryta which experiment had shown me to be more stable at a high temperature than carbonate of lime, and less stable than the carbonates of potassa and soda.

For this purpose, I made a mixture of 65 grammes of anhydrous carbonate of soda in powder with 250 grammes of chalk. To this was added sufficient water only to obtain small agglomerations under the form of small and not very coherent nodules. This mixture was maintained at a red heat and traversed for six hours by steam engendered under the ordinary atmospheric pressure and circulating slowly to diminish the carrying off of the alkali; at the expiration of this time, the decarbonisation was complete.

The alkimetrical test for estimating the caustic soda left in the mixture, showed 95 per cent. of carbonate of soda decomposed: now, as there was no trace of carbonic acid in the product of the calcination, I conclude that the 5 per cent. of carbonate of soda was absorbed by the sides of the porcelain tube and converted into silicate of soda.

The principal requisites for the success of this operation are the maintenance of the matters under the spongy form, a state of division easily realised by the lime when it imbibes carbonate of soda in fusion.

This ingenious artifice belongs of right to M. Dumas, who substituted a more convenient mixture for that which M. Persoz recommended for the preparation of marsh gas. MM. Will and Warrentrapp afterwards made one of the happiest employments of soda lime in the analysis of nitrogenous organic matters. Finally, it will very soon be seen that before M. Boussingault I had adopted a similar expedient for the preparation of baryta.

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In the year 1850, and a short time after the presentation of my work on the carbonates, I undertook the experiments of which I here give a summary, according to the order of performance as it appears in my laboratory register.*

All these mixtures were deposited in a long platinum boat placed in a large porcelain tube. To one of the ends was adjusted a retort containing water which was boiling slowly: the opposite extremity terminated in a gas and safety tube. The experiment always lasted four hours.

FIRST EXPERIMENT.

123·3gr.	CO^2BaO	Disengagement of H. and CO^2; semifusion of the mixture; decomposition of 10 per cent. of the carbonate of baryta employed.
62·5	CO^2CaO	
7·5	C	

SECOND EXPERIMENT.

123·3gr.	CO^2BaO	Disengagement of carbonic acid; semifusion of the mixture; decomposition of 30 per cent. of the carbonate of baryta employed.
62·5	CO^2CaO	

These two experiments teach us: 1st. that a great portion of the carbonate of baryta having been enveloped with fused baryta thus escapes the action of the steam; 2nd. that by employing charcoal, the action of this steam is diminished, that is to say that in proportion as the carbonate of baryta is decomposed, the charcoal separates the elements of the water, producing fresh carbonic acid and hydrogen whose presence impairs the success of the experiment, as will very soon be seen.

THIRD EXPERIMENT.

123·3gr.	CO^2BaO	Mass slightly porous; decomposition of 50 per cent. of the carbonate of baryta employed.
125·0	CO^2CaO	
7·5	C	

FOURTH EXPERIMENT.

123·3gr.	CO^2BaO	Mass slightly porous; decomposition of 90 per cent. of the carbonate of baryta employed.
125·0	CO^2CaO	

FOURTH EXPERIMENT REPEATED.

123·3gr.	CO^2BaO	Mass more porous; decomposition of 90 per cent. of the carbonate of baryta employed.
190·0	CO^2CaO	

These results being obtained, I executed in the month of August, 1850, at M. Robert de Massy's, distiller, at Rocourt, near St. Quentin, the following three operations.

The apparatus was composed of three cylinders of cast iron 2 m. 5 in length, and 7 centimetres in diameter. All three were placed on the same horizontal plane in a brick furnace heated with coal at the distance of about 10 centimetres apart. In each tube circulated steam furnished by a generator. The three apparatus had been rendered independent by means of branches with stop-cocks for regulating or suppressing at will the jet of steam. The cylinder of the middle one containing carbonate of baryta and charcoal received no steam. The opposite extremity of each cylinder terminated in a copper tube conducting the gaseous products into a species of water trough, in order to submit them to analysis.

FIFTH EXPERIMENT.

1200gr.	CO^2BaO	After six hours' heating, white porous matter, containing very little caustic baryta.
1200	CO^2CaO	
200	C	

SIXTH EXPERIMENT.

1200gr.	CO^2BaO	No decomposition.
200	C	

SEVENTH EXPERIMENT.

1200gr.	CO^2BaO	Porous white matter; decomposition of 40 per cent. of the carbonate of baryta employed.
1200	CO^2CaO	

We see, in the first place, from these results, that, to decompose the carbonate of baryta by means of charcoal, a higher degree of heat is required than with the aid of superheated steam.

In the second place, the fifth and seventh experiments furnished smaller quantities of baryta than the third and fourth corresponding operations performed in my own laboratory.

I attributed this enormous difference to the decomposition of a certain quantity of steam by the sides of the cast iron cylinder.

Indeed, to retard the circulation of the steam and in order the better to superheat it, I was obliged to pass in the jet through only a small section of the stop-cock. It is then understood that the action of the whole of the steam, acting at the same time, was found to be diminished by the whole quantity of water which was decomposed on the cast iron.

On returning to my laboratory, I repeated the seventh experiment, with all the precautions of the original execution, that is to

* These experiments were also communicated in April, 1850, to M. Cahours, who published in his lecture at the Sorbonne the best of all these results.

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say by making the steam circulate very slowly through 1400 grammes of the mixture placed this time in a tube of impermeable earthen ware. After six hours' heating, I had decomposed 88 per cent. of the carbonate of baryta employed.

In concluding this explanation, I should add that all these experiments were repeated with hydrate of lime, and that they led to the same result in a rather shorter time.

Consequently, either lime or carbonate of lime may be made use of; the preference in this case can only be actuated by the difference of expence between carbonate of lime for a long duration of experiment, and lime for a shorter operation.

The experiments which M. Bousingault has published on the subject of the superoxidation of baryta and the partial deoxidation of the binoxide of barium are of the same order as those which led Lavoisier to the composition of the air by means of mercury alternately oxidised and deoxidised; but they present the high degree of interest of being capable of serving one day for industrial reactions with the aid of a base of small value, compared with mercury.

However, in the present state of things, it was necessary to make the hydrate of baryta by the process of the carbonate mixed with charcoal, and also to wash the calcined mass, and concentrate the solutions to dryness; whilst by the simple act of mixing chalk or lime with the artificial or natural carbonate of baryta, a porous mixture of oxide of calcium impregnated with hydrate of baryta is finally obtained, which is found in the best conditions for undergoing superoxidation without change of vessel and without any necessity for previously extracting the hydrate of baryta. I shall therefore esteem myself very happy in having completed the idea of M. Bousingault, furnishing him with the means of preparing in abundance and cheaply the substance which he requires.

The operations which I have just detailed are too easy of execution not to become a starting point for the manufacture of pure baryta for commerce; especially in endeavouring to realise the conditions of the speculation last above-mentioned.

I should add that the carbonates of lithia and strontia act like those of potassa and baryta with regard to superheated steam, which may be interesting as to the applications of strontia in pyrotechny.

But as it would be impossible for me, except at considerable expence, to continue the researches which it would be necessary to make for raising a laboratory experiment to the rank of an industrial operation, I shall limit my task (the principle being known) to briefly pointing out the more general arrangements for attaining this object.

The preparation of the baryta should be performed in retorts of refractory earth, and of the form and dimensions of gas retorts.

The mixture of carbonate of baryta with chalk or lime and the moistening of it should be performed in barrels moving round a horizontal axis. The charging and drawing of the retorts should be performed in the ordinary manner.

The heat acquired by the mixture, after removal from the retort, as well as that developed by the chemical action of the water on this mixture, serves to directly heat the water, which, by methodical lixiviations, extracts all the baryta and furnishes properly concentrated solutions.

The steam, far from being produced with violence, should, on the contrary, be freely exhaled from the reservoir and slowly traverse the mixture of the carbonates at a moderate red heat.

It would be sufficient therefore to place in the vicinity of the furnace a boiler from which the steam would be distributed to all the retorts by large tubes ending in the door of each retort.

Finally, the carbonic acid produced would be turned to account by directing it into saccharate of baryta in suspension in water.

Thus the residue of hydrate of lime, previously exhausted of baryta, would be mixed with the carbonate of baryta resulting from the decomposition of the saccharate by carbonic acid, and would recompose a new granular mixture for charging the retorts, after having undergone a slight desiccation by means of the waste heat of the brick-work of the furnaces.

This sketch should suffice for the engineers and manufacturers who may be desirous of trying new experiments on the interesting manufacture of the saccharate of baryta which M. Dubrunfaut has devised, by making an ingenious application of the properties discovered in the saccharates of baryta and lime by M. Peligot.

In the applied sciences, all facts sooner or later take their place and assume their rightful degree of importance, and it may be said that the saccharates of M. Peligot, in revealing to M. Dubrunfaut his discovery, have exerted their influence in the same way as the celebrated experiments of Duhamel-Dumonceau, when they inspired Dr. Boucherie with the idea of making coloring and preservative liquids penetrate into the vascular and fibrous tissues of woods.—*Annales de Chimie et de Physique*, August, 1851.

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REACTIONS OF THE IODIDE, BROMIDE, AND CHLORIDE OF POTASSIUM, IN THE PRESENCE OF CERTAIN SALTS.

BY M. BESNOU.

Reactions of Iodide of Potassium.

Mixed with	Bruised in the open air.	In solution concentrated by heat.	Heated in a tube, over a spirit lamp.
Nitrate of ammonia....	Prompt decomposition; becomes yellow; and turns blue with starch	Of a yellow color; turns blue with starch	Abundant violet vapors immediately.
Sulphate of ammonia..	Idem	Idem	Idem
Phosphate of ammonia	More prompt	Idem	Idem
Oxalate of ammonia...	Prompt	Idem	Idem
Sesquicarbonate of ammonia.....	Idem	No apparent decomposition	Idem
Hydrochlorate of ammonia	Idem	Idem	Idem
Nitrate of soda	No apparent decomposition	Idem	Considerable disengage- of iodous vapors
Sulphate of soda.....	Idem	Idem	Idem
Phosphate of soda	Idem	Idem	Idem
Borate of soda.....	Idem	Idem	Idem
Carbonate of soda.....	Idem	Idem	Idem
Chloride of sodium....	Idem	Idem	Idem : requires a much higher heat
Sulphate of magnesia..	Very prompt reaction	Idem	Iodous vapors immediately
Nitrate of lime.....	Idem	Idem	Idem
Chloride of calcium....	Idem	Idem	Idem
Nitrate of potassa	No reaction	No reaction	No reaction
Sulphate of potassa.....	Idem	Idem	Idem
Chloride of potassium..	Idem	Idem	Idem
Carbonate of potassa ..	Idem	Idem	Idem
Boracic acid	Reaction	Reaction	Reaction: disengagemt. of vapors of iodine
Silicic acid (calcined)..	No reaction	No reaction	Disengagement of iodine at a high temperature
Common salt of commerce	Decomposition	Idem	Much more prompt reaction than with this salt pure.

Bromide of Potassium.

Nitrate of ammonia....	Nothing perceptible	Nothing perceptible	Disengagement of bromine much less easy than that of iodine
Sulphate of ammonia..	Idem	Idem	Nothing very perceptible
Phosphate of ammonia	Idem	Idem	Disengagement of hydrobromic acid.
Hydrochlorate of ammonia.....	Idem	Idem	Nothing
Carbonate of ammonia	Idem	Idem	Nothing
Sulphate of soda.....	Idem	Idem	Nothing
Sulphate of magnesia..	Idem	Idem	Disengagement of hydrobromic acid
Nitrate of lime.....	Idem	Idem	A little vapor of bromine
Chloride of calcium....	Idem	Idem	Nothing
Nitrate of potassa ...	Idem	Idem	Nothing

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CHLORIDE OF POTASSIUM.

Nitrate of ammonia...	Nothing apparent	Nothing perceptible	Disengagement of chlorine at a powerful heat
Phosphate of ammonia	Idem	Idem	Disengagement of hydrochloric acid
Hydrochlorate of ammonia.....	Idem	Idem	No reaction: disengagement of acid towards the end
Sulphate of magnesia..	Idem	Idem	Disengagement of sulphuric and hydrochloric acids
Sulphate of soda.....	Idem	Idem	Nothing
Nitrate of potassa.....	Idem	Idem	Nothing
Nitrate of lime	Idem	Idem	Nothing

From these reactions it results :—

1. Chloride of potassium is much more stable than the bromide and especially than the iodide of the same base.

2. All the ammoniacal salts seem to be able to decompose iodide of potassium at the ordinary temperature, and to liberate the iodine.

3. The salts of lime and magnesia act in the same manner.

4. The salts of soda liberate iodine only after aqueous fusion, consequently over 212 degrees.

5. It is probable that all the salts containing water of crystallisation would have an analogous action, as well as the weaker acids.

6. It is not astonishing that the atmosphere contains iodine; it must be free and not conbined in it, since it is here demonstrated that the most stable iodide loses its iodine under the influence of simple contact with calcareous magnesian and ammoniacal salts which are constantly found in all waters and soils and that at the ordinary temperature.

7. On the contrary, salts of potassa retain or fix the iodine. This perfectly accounts for the advantage, for the necessity, perhaps, of adding a little caustic or carbonate of potassa, before incinerating products to be tested for iodine, such as cod and skate liver oils, and plants containing a small quantity of iodides.

8. The decomposition of the bromides is much more difficult than that of the iodides, and much easier than that of the chlorides. If bromine had presented as clear and decisive reactions as iodine, it would have been discovered first, whilst iodine, being disengaged with so much facility, and existing, moreover, in such minute quantity in waters and soils, it is easy to explain why it so long escaped the observation of chemists.

9. Notwithstanding the much greater stability of the chlorides, the saline residues of the calcination, either of waters or of organic products, do not always represent the whole of the clorides which they contain, and the quantity of free alkalis will vary according to the nature of the elements present, and the temperature at which the incineration has been effected.

10. Finally, there exists a very special mode of action on the part of sulphate of magnesia, a mode of action which would tend to bring this oxide nearer to alumina in the class of which it has generally been suppressed.—*Comptes Rendus*, No. 5.

NOTE ON THE ACTION WHICH CARBONIC ACID EXERTS ON IRON IN THE PRESENCE OF WATER.

BY M. GOLFIER BESSYERE.

BERZELIUS, in the present (French) edition of his *Traité de Chimie*, vol. II., p. 660, states, "that iron is oxidised very rapidly in humid air, especially in the presence of a large quantity of carbonic acid.

"That iron, in being covered with rust, is not oxidised solely at the expense of the water, *the hydrogen of which combines in the nascent state* with the nitrogen of the air, producing ammonia."

In the *Cours de Chimie Générale* of MM. Pelouze and Frémy, Vol. II., p. 298, the authors state that :—"Iron, exposed to humid air, is covered with a layer of hydrated oxide of iron, which is called rust; the metal is oxidised with rapidity, because an element of a battery is formed, of which the rust is the negative, and the metal, the positive pole: *the water is then decomposed*, and the iron oxidises rapidly. The oxidation of the iron is accelerated by the presence of carbonic acid."

So far as I am aware, nothing more explicit has been published concerning the chemical mode of action which takes place between carbonic acid and iron in the presence of water; the testimony of such respectable authorities has rendered further

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bibliographical researches unnecessary.

From these quotations one would be naturally led to conclude that the elements of the air and water are dissociated only by means of electricity, or because ammonia may be produced in these circumstances, or else that the presence of air is essential to the exertion of this action of carbonic acid.

These explanations did not appear to me sufficiently clear or sufficiently demonstrated; however, I still remained in doubt, when an accidental circumstance induced me to undertake the investigation of the most authentic facts.

M. Welter, a friend of mine, was ordered by his physician, to use the water of Bussang as a ferruginous water; and as by analysis he was unable to detect any trace of iron in this water, he asked me at the commencement of the year 1850: 1st. if this water really contained; 2ndly, into what is the true mode of action of carbonic acid on iron in the presence of water?

The following was the result of the experiments which I made on this subject.

Water powerfully charged with carbonic acid, put in contact with iron turnings, immediately gives rise to a solution of protocarbonate of iron, which is perfectly colorless and extremely limpid.

This solution, exposed in an open vessel with free access of air, in a short time abandons *all its iron* in the state of hydrated peroxide.

This well-proved fact is sufficient for explaining how it is that some chemists have detected the presence of carbonate of iron in certain mineral waters, whilst others, in analysing the same waters have found none.

Indeed, it is probable that these waters are really ferruginous on leaving the spring; but, as they are collected to be put into bottles only at a certain distance and after a certain lapse of time, these circumstances may, according to the above observations, be the cause of the complete disappearance of the iron. They may likewise explain why I found no trace of iron in the analysis to which I had subjected several bottles of the water of Bussang, whilst M. Barruel, who has given the analysis of it, found some in it,—very little it is true, but he detected 16 thousands.

I observed an analogous fact with regard to the springs of Saint-Alyre and Saint-Nectaire, (Puy de Dôme), where a little speculation is carried on in moulding the calcareous deposit of these waters, it has long been found necessary to make them describe a certain course in the trenches where they deposit the hydrated oxide of iron which, without this precaution, would color the products.

One serious consequence of the fact thus proved is, that carbonate of iron can be administered as a therapeutical agent only in presence of a great excess of carbonic acid.

As to the question of what is the true mode of action of carbonic acid on iron in presence of water, the result of my experiments is still more clear.

I will now describe the apparatus which I used. I made a constant source of carbonic acid by means of a large bottle to which was adjusted, under a hermetic closure, a long dropping tube, whose small orifice passed under a diaphragm of copper, which was supported by three copper wires, and charged with large pieces of white marble; the closure was furnished with a tube for the gas to pass through, fitted with a stop-cock, by means of which the disengagement of gas could be regulated. The carbonic acid was washed in an intermediate vessel, containing an alkaline carbonate, and thence passed into a flask filled with iron turnings, communicating with the intermediate vessel by means of a tube which reached nearly to the bottom of the flask containing the iron turnings; this vessel may be filled with water deprived of air by means of an S tube; it is, besides, furnished with a tube for collecting gases, and with a syphon furnished at its lower end with a stop-cock, by means of which the ferruginous water may be drawn off conveniently, and without dismounting the apparatus.

I operate by pouring dilute sulphuric acid into the dropping tube until the marble is evidently acted on; then I close the stop-cock, and when no more carbonic acid is produced, and that produced has raised the liquid in the dropping tube as much as possible, I again add acid to the height of about 50 centimetres; and then I open the stop-cock moderately in order to drive all the air out of the apparatus by means of the carbonic acid; then, without interrupting the disengagement, I close the stop-cock of the syphon, and I pour into the S tube water deprived of air, until the flask containing iron turnings is quite full. Then I relax the current of carbonic acid and moderate it in such a manner as to have one bubble in the second, and the apparatus thus arranged acts for a long time alone and with perfect regularity.

Now the following is what is produced:—the water becomes much more limpid, and after a certain time, it is remarked that the spires of iron are covered with bubbles of gas, which are at first very small, but which gradually grow larger and are ultimately detached; these bubbles are not carbonic

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acid, and if the excess of the latter be carefully collected in a flask filled with liquid ammonia, the excess of carbonic acid absorbed leaves as a residue pure hydrogen.

I think, therefore, that I may affirm that carbonic acid in presence of iron and water determines the decomposition of the latter and gives rise to the formation of a protosalt of iron which it retained in solution in the water, so long as there is an excess of carbonic acid and absence of contact with the air, but that it separates under the form of a white precipitate, if this excess of carbonic acid be driven off without contact with the air, or else that it very soon passes to the state of a mixture of carbonate and oxide of iron if we operate in an open vessel.

I think that we have here the explanation of a geological fact connected with the formation of certain deposits of spathic iron. I have even tried some experiments with the object of effecting the crystallisation of the above-mentioned deposit; the apparatus which I have just described is perfectly adapted to every experiment of which this little work is susceptible, which moreover may be summed up by the following equation :—$Fe + CO^2 + HO = FeOCO^2 + H$.—*Annales de Chimie et de Physique*, August, 1851.

NEW CHEMICAL RESEARCHES ON THE NATURE AND ORIGIN OF THE ACID PRINCIPLE PREDOMINATING IN THE GASTRIC JUICE.

BY M. N. BLONDLOT.

THE gastric juice is always acid; this is a fact beyond dispute: but there is by no means so much certainty with respect to the principle to which this acidity is due. It has been asserted by turns that it is acetic acid, phosphoric acid, hydrochloric acid, and, lately, lactic acid. I alone have stated that this acidity is due exclusively to biphosphate of lime, and, notwithstanding the objections which have been made to this assertion, I am more than ever convinced of its correctness. Moreover, the new work which I submit to the Academy may be divided into two parts, the first having for its object to demonstrate the *nature*, and the second the *origin*, of the acid principle which predominates in the gastric juice.

FIRST PART.

I at once proved that the principle in question could not be one of the four acids above-mentioned, because it does not coagulate albumen, in which it differs from lactic and hydrochloric acids, and because it yields by distillation neither acetic acid nor any other organic acid: as regards phosphoric acid, as phosphate of lime exists in the gastric juice, it follows that if phosphoric acid also exists in it, it must be in the state of acid phosphate.

A simple and characteristic fact confirms me in this view. Gastric juice put in contact with an exeess of carbonate of lime, causes no effervescence, and is not perceptibly neutralised; now, as, of all acids and of all acid salts known, the earthy biphosphates alone act thus, it is strong reason for thinking that the acidity in question should be attributed to biphosphate of lime. It has been objected, it is true, that if the gastric juice is not neutralised by the carbonate of lime, it is because the carbonic acid disengaged remains in solution; but this will, I think, be sufficiently refuted when I state that the same negative effects were observed at the boiling temperature. It has also been pretended that if the fluid in question does not effervesce with chalk, it is owing to the extreme dilution of its free acid, and as a proof, it is stated that it attacks it very well when it is concentrated; but may it not rather be feared that that is owing to a portion of hydrochloric acid disengaged from the chlorides by the biphosphate, under the influence of heat, being retained in the residue by the organic matter, and that it is then this acid which acts on the carbonate of lime.

Moreover, I can bring in support of my assertion a direct experiment. After having neutralised some gastric juice with a slight excess of carbonate of soda, I filtered and concentrated the liquor and incinerated the residue. The ash was dissolved in water acidulated with a little sulphuric acid, at the boiling temperature: now the filtered liquid gave, with lime water, a perfectly characterised phosphate of lime, which, in the absence of any other phosphate, demonstrates that the acid which held the phosphate of lime in solution was really phosphoric acid in the state of biphosphate.

SECOND PART.

To determine the origin of the biphosphate of lime contained in the gastric juice, I proceeded first to the investigation of the other inorganic elements of this fluid, as follows :—

After having evaporated some gastric juice to dryness, I carbonised the residue. During this operation, some *hydrochlorate of ammonia* was sublimed. The charcoal being washed with distilled water, the washing waters, which were perfectly neutral, were not rendered turbid by lime water, which shows the absence of soluble

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phosphates. When evaporated, they deposited cubic crystals of *chloride of sodium*, whilst the mother-liquor contained a deliquescent salt, soluble in alcohol, which was no other than *chloride of calcium*. Finally, the incinerated charcoal furnished a certain quantity of phosphate of lime, which existed in the normal juice in the state of biphosphate of lime, as we have seen.

After this qualitative analysis, I determined, by quantitative analysis the proportions by weight of the different elements of the fluid under investigation. The result is expressed in the following table :—

Water.....	96·71
Biphosphate of lime.....	0·60
Chloride of calcium.....	0·32
Chloride of sodium.....	0·16
Hydrochlorate of ammonia	0·36
Organic matter.....	1·80
Loss	0·05
	100·00

The attention is here attracted by the large proportion of solid matters compared with the water. Calcareous salts are present in very remarkable quantity. What is their origin? The blood, being alkaline, cannot contain them ready formed, but it contains the elements of them, namely, neutral phosphate of lime and chloride of sodium. Indeed, the latter may be decomposed, in the sides of the stomach, into soda which remains in the blood and into hydrochloric acid which reacts on the neutral phosphate of lime in excess, and the two salts in question will be simultaneously produced as indicated in the following equation :—

$$\underset{\text{Neutral phosphate of lime.}}{(CaO)^2, PhO^5} + \underset{\text{Hydrochloric acid.}}{HCl} = \underset{\text{Biphosphate of lime.}}{CaO, PHO^5} + \underset{\text{Chloride of calcium.}}{CaCl} + \underset{\text{Water.}}{HO}$$

The neutral phosphate yielding half of its base to the hydrochloric acid, there must be as much calcium in one as in the other of the salts produced; now this is precisely the case, for 0·60 of biphosphate of lime produce, within an insignificant quantity, as much lime as 0·32 of chloride of calcium. In the eyes of a chemist, this fact is peremptory.

This explanation is further supported by the smallness of the quantity of chloride of sodium contained in the gastric juice, the greater part of this salt having been decomposed to furnish the hydrochloric acid.

Finally, a peculiarity which, in some measure, puts the seal on this theory, is that, when the dilute hydrochloric acid reacts on the excess of neutral phosphate of lime, there always remains an almost imperceptible trace of this acid in the state of absolute freedom, which is explained by the well known laws of affinity: now the gastric juice itself also contains a trace of free acid, which enables it to tarnish the surface of calcareous spar, but the quantity of which is, however, so small that it cannot be entered into the account of the acidity of that fluid.

As to the cause which determines the decomposition of the chloride of sodium, I think, agreeing on this point with many distinguished chemists and physiologists, that it may be attributed to an electrical action set up in the sides of the stomach. It is certain that the reactions above-mentioned may be artificially reproduced, by submitting to the action of a feeble battery a very simple apparatus, in which neutral phosphate of lime is held in suspension in a solution of common salt: now, whilst the soda goes to the negative pole, at the positive pole is formed a mixture of biphosphate of lime and chloride of calcium, with an infinitesimal trace of free acid.—*Comptes Rendes*, No. 5.

ON THE BEHAVIOR OF SULPHUROUS ACID TOWARDS SOME PER-SALTS OF COPPER.

BY O. DŒPPING.

MR. DŒPPING points out the behavior of sulphurous acid towards the nitrate, acetate and sulphate of copper. In a very dilute solution of nitrate of copper the acid produced no change. What is stated with respect to the other two salts contains nothing more than is known from the researches of Messrs. Chevreul, Berthier, Vögel, Rammelsberg and Muspratt. The red crystals which sulphurous acid precipitates from the solution of pernitrate of copper, and those which are subsequently obtained by saturating with carbonate of soda, are regarded by the author as a new sulphite of the protoxide of copper, $3Cu^2O+4SO^2+4HO$.

The red crystals may be washed with water, in which they are insoluble, have no odor either in the moist or in the dry state and do not alter in appearance when dried. They dissolve in hydrochloric acid with a yellow color, with evolution of sulphurous acid; and on the addition of water, protochloride of copper separates unless too much hydrochloric acid has been added. Chloride of barium produces no precipitate in this hydrochloric solution; a solution of

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potassa throws down a dirty yellow precipitate.

The crystals dissolve in very dilute nitric acid, without any disengagement of gas, forming a colorless liquid in which no precipitate is formed by a solution of baryta. Strong nitric acid alters them; they dissolve with a blue color; and solution of baryta now produces in the solution a precipitate insoluble in water and acids.

Sulphuric acid expels sulphurous acid, and the crystals change their form and color.

Ammonia dissolves the crystals readily and instantly, with an intense blue color.

Boiled with water, the salt is but slightly affected; on cooling, a yellow coating is deposited on the sides of the vessel, and chloride of barium produces in the liquid a white precipitate, insoluble in hydrochloric acid.

No evolution of sulphurous acid is perceptible on ebullition. Dried at 212° in the water-bath, 2·358 grms. of the air dried salt lost 0·003, and in a second experiment 2·878 lost 0·004 grm. water—a loss which can only be ascribed to hygroscopic water. The salt is not anhydrous; when heated in a test-tube over a spirit-lamp, there is a copious condensation of water on the sides of the tube, and at the same time the odor of sulphurous acid is disengaged. On analysis the author found.—

Cu^2O	55·98	3	=2673·60	56·55
SO^2.....	33·23	4	1603·00	33·92
HO.....	10·68	4	449·92	9·73

If we calculate the author's results according to the formula of the salt recently described by Rammelsberg, $CuO, SO^2 + Cu^2O, SO^2 + 2HO$, we have—

Cu	49·76	3	=96	49·5
SO^2	33·23	2	64	32·9
HO	10·68	2	18	9·2

This composition agrees therefore with that calculated with Rammelsberg's formula, according to which the red salt contains likewise peroxide of copper. The behaviour towards ammonia corroborates this view.—*Bulletin de St. Pétersbourg*, ix. p. 179.

NOTE ON THE ACTION OF NITRATE OF POTASSA ON NITRATE OF COBALT.

BY M. E. SAINT EVRE.

When a little nitrite of potassa dissolved in water is poured into a solution of nitrate of cobalt acidulated with nitric acid, a considerable quantity of binoxide of nitrogen is disengaged, which with the atmospheric oxygen, forms red vapors. Nitrate of potassa speedily crystallizes in the liquor, if it is sufficiently concentrated; at the same time it is decolored, and a pulverulent, crystalline matter, of a fine yellow color is deposited, whose shade, which resembles that of Indian yellow, corresponds to the yellow of the first chromatic circle of M. Chevreul.

Analysed with all possible care, by processes differing from those pointed out in works on analysis, which could not be adopted in the circumstances in question, this yellow substance furnished results which lead to the following crude formula represented in equivalents by

$$N^2\,O^{10}\,CbK$$

The following are the reactions of this new salt of cobalt:—

Suspended in water, it is attacked by sulphurretted hydrogen, without heat, only after a long time. It is not attacked cold by chlorine. It is necessary to raise the heat to 212°F. for the rose coloration peculiar to the salts of cobalt to be manifested.

It is anhydrous, insoluble in water at the ordinary temperature, as well as in nitric and hydrochloric acids which decompose it only at the boiling temperature, when red vapors are disengaged. When boiled for a long time with water, it is ultimately dissolved, assuming a rose tint, and disengaging colorless acid vapors. The evaporated liquor furnishes a new salt of a lemon color, distinct from the original salt.

Treated by hydrogen in a glass flask—heated by means of a spirit lamp, it disengages at first acid vapors, and afterwards considerable quantities of ammonia. Finally, by treating the residue with water, metallic cobalt is obtained, as well as an alkaline liquor which holds cobalt in solution.

Calcined in a current of nitrogen, it disengages binoxide of nitrogen, and gives as a residue a black oxide, which, put in contact with hydrochloric and oxalic acids, developes chlorine with the one, and carbonic acid with the other.

Boiled with potassa dissolved in water, it yields an oxide endowed with the same properties.

From experiments made some months ago I am induced to consider this new salt of cobalt as capable of furnishing a color useful in painting, and possessing in a high degree the qualities desired by artists.

At present I have only been able to determine the proportions by weight of the elements which constitute this new and singular compound. I also defer for a short time the discussion as to the degree of oxidation of the nitrogen and cobalt. The employment of deoxidisers, such as sulphurous acid, and a more profound study of

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the reactions of this double salt, will, I hope, very soon enable me to solve this question.—*Comptes Rendus, No.* 6, 11 *Aug.*, 1851.

ON THE MODIFICATIONS CAUSED IN ALBUMEN BY THE PRESENCE OF NEUTRAL SALTS, AND BY PURELY MECHANICAL ACTIONS.

BY M. MELSENS.

(Extract of a letter to M. Dumas.)

You have doubtless heard something of my work on albumen; it may be briefly recapitulated as follows:—

1. By changing the physical constitution of albuminous liquids by the addition of soluble salts, albumen is rendered precipitable by phosphoric acid with 3 equivalents of water, and by acetic acid. The first of these acids redissolves the precipitate when it is added in excess. The precipitate formed by acetic acid may frequently be redissolved in trihydrated phosphoric acid. An excess of acetic acid does not redissolve the precipitate.

2. The albumen of the blood does not resemble the coagulated matter of white of egg.

3. Eggs beaten up into a snow contain, besides albumen, artificial cellular tissue.

4. When white of egg (after several filtrations) is agitated, it presents a phenomenon analogous to the coagulation of fibrine by the agitation of the blood; it is converted into an organised membrane, which in no way resembles fibrine, but which presents the appearance of serous membranes and cellular tissue.

The following are the objections which may be started on the subject of this mechanical coagulation of the albumen, and into which I enter in my memoir.

1. It may be said that the coagulation is nothing but a true froth.—The serum of the blood froths, but it does not give organised membranes.

2. It may be said that the dessication of the sides of the vesicles of the froth formed produces the solidification of the albumen.—I saturate the gases with steam.

3. Oxidation due to the intervention of the air might also be suggested. I make the membranes appear in hydrogen, carbonic acid and air indifferently.

4. Finally, the effects observed may be attributed to an influence of the gases. I make a *marteau d'eau* with 1 volume of white of egg and 1 volume of water. After the first filtration, I saturate the filtered liquid with sea salt; I filter a second and a third time, until I have obtained a *perfectly* limpid solution. I add two volumes of water. The whole is introduced into a drawn out tube or a flask. A vacuum is made, the liquid is boiled, and it is sealed with the lamp. Now the limpid solution becomes turbid after a few shakes; the quantity of albumen solidified is in proportion to the number of shakes. On examining the solid matter formed, with the microscope, a granulated matter and fibres of cellular tissue are found in it.

In conclusion, the albumen in the egg seems to approach to the state in which fibrine exists in the blood, which is not the case with the albumen of the blood.—*Comptes Rendus*, No. 8, 25th Aug. 1851.

ON SOME PHENOMENA OF FERMENTATION.

BY M. BUCHNER, JUN.

M. Buchner discovered some time since, that putrid bile contained a considerable quantity of sulphuric acid, and thought that this acid, which does not exist in fresh bile, was formed at the expense of the elements of the taurine. For the purpose of studying the decomposition to which this sulphuretted principle is subject under these circumstances, M. Buchner put the mucus of the bile in contact with a solution of taurine mixed with bi-carbonate of soda. After several days' exposure in a warm place the mixture began to ferment. Carbonate of ammonia was formed, and the liquor when mixed with a concentrated acid, disengaged sulphurous acid. Consequently, the definitive products of the slow oxidation of taurine, under the influence of a ferment, are carbonic acid, ammonia, and sulphuric acid, this last proceeding from the oxidation of the sulphurous acid first formed.

The manner in which taurine is decomposed in this experiment is not analogous with the reaction which takes place when taurine is treated by caustic potassa. M. Redtenbacher has shewn that under the influence of this powerful alkali taurine is decomposed into ammonia, sulphurous acid and aldehyde. In truth, aldehyde is not found among the products which result from the fermentation of taurine; but under certain circumstances M. Buchner has found small quantities of acetic acid among the products of decomposition of taurine, and even of bile. The proportion of this acid which is discoverable is, however, never that indicated by theory. This is because the acetic acid disappears in its turn among the complex phenomena of fermentation.

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The author has ascertained by direct experiments that the acetate of potassa is rapidly transformed into carbonate under the influence of mucus, or of animal matter in general in a state of decomposition.

This latter observation has led M. Buchner to study the fermentation of some other alkaline salts formed by the organic acids. When the alkaline citrates, tartrates, succinates, and oxalates are dissolved in an infusion of almond meal, these salts are transformed into carbonates with more or less rapidity. The oxidation is so much the more rapid as the constitution of the organic acid is more complex. Those which oxidise the most quickly are the citrate and tartrate of potassa; the succinate and acetate oxidise more slowly, and the oxalate, the acid of which is placed in a manner on the limits of organic substances and mineral compounds, resists for the longest time the oxidising action of the air under the influence of a ferment. The analogy is evident between these phenomena and those which take place in the organism itself, when the salts of potassa formed by the vegetable acids experience in their rapid passage through the economy, an oxidation which transforms them into carbonates.

The author is of opinion that even malate of lime would, under the influence of ferments, experience a slow combustion which would transform it into carbonate. In reality this oxidation is not direct, but in a manner passes through two distinct phases. The valuable observations of M. Dessaignes have taught us that in these circumstances malic acid is transformed into succinic acid; but this in consequence of a more complete oxidation may disappear in its turn by transformation into more simple products, (perhaps into butyric and acetic acids*) and finally into carbonic acid.—*Annalen der Chemie und Pharmacie.*

NOTE ON A NEW ACID DERIVED FROM VALERIANIC ACID.

BY M. V. DESSAIGNES.

VALERIANIC acid, as is known, is very little altered by the action of nitric acid. I have sought for a means of producing a very prolonged reaction of these two acids. In the same apparatus which I used for converting butyric acid into succinic acid, (See THE CHEMIST, New Series, Vol. I. p. 255) I heated, almost to the boiling point, and for 18 days without interruption, a mixture of monohydrated nitric acid and valerianic acid, sometimes extracted from valerian and sometimes obtained from amylic alcohol by M. Balard's process. I added nitric acid from time to time, so as to maintain the bulk of the mixture uniform. The products of this reaction varied in successive operations. The most abundant body, except the valerianic acid itself which remained in great part unaltered, was the acid which forms the subject of the present note, and which may be obtained equally from the two valerianic acids from different sources. With the acid obtained from valerian, there is produced at the same time another deliquescent acid, and a neutral, crystalline matter, containing nitrogen and possessing a slight odor of camphor. With the acid from potato oil, a neutral, nitrogenous oil, with the odor of camphor. I will hereafter make known the result of my researches on these various products.

The mixture contained in the retort was distilled. The first half of the condensed liquid contained a colorless, acid oil, which diminished greatly by washing, and which becomes solid or liquid according to the origin of the acid employed. On pursuing the distillation, the retort is again filled with abundant red vapors; the operation is then stopped, and the residue of the retort is gently heated in a capsule until it has acquired a syrupy consistance. There are formed in a long time, thin crystals which are freed from their mother liquor by pressure between blotting paper, and which are easily purified by one or two crystallisations.

This acid, which is very pure, crystallises in superb rhombohedral tables, which are often covered like the tiles of a roof. It begins to sublime at 212° F., but its boiling point is much higher. It dissolves very well in warm water, and much less in cold water, on the surface of which the crystals sometimes perform gyratory movements.

The salt of lead is very soluble in water and crystallises in fine prisms. The salt of baryta is soluble. The salt of lime crystallises in needles which dissolve easily on being put into water. The salt of iron is a precipitate which resembles the succinate. The salt of silver is a light precipitate which dissolves in boiling water, and crystallises in cooling, in fine and brilliant prisms.

I analysed, by means of oxide of copper, with the addition of metallic copper, the acid dried in vacuo, and its salt of silver

* This recalls to our memory that by a precisely analogous reaction, tartaric acid may be transformed, by the fermentation of the tartar, into metacetic acid, (the pseudo acetic of M. Noellner; the butyro-acetic of M. Nicklès.)

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dried at 212° F. The nitrogen could not be determined under the form of ammonia. Having no pump, I employed the old process of M. Dumas, driving the air out of the tube by a prolonged current of carbonic acid.

The acid gave:	The salt of silver gave:
C .... 40·93	C ..... 23·61
H .... 6·18	H ..... 3·63
N .... 10·12	Ag..... 42·27

The foregoing numbers agree very well with those which represent the composition of nitrovalerianic acid, and which are, for the formula $C^{10}H^{18}N^2O^8$:—

C.....40·81	C.....23·62
H..... 6·12	H..... 3·15
N ..... 9·52	Ag ....42·52

It might be, however, and the physical properties of this new acid would induce me to think so, that it is no other than nitroangelic acid, whose formula would be .

$$C^{10}H^{14}N^2O^8.$$

and the chemical composition would be represented by:—

C.....	41·37
H.....	4·82
N.....	9·65

—*Comptes Rendus*, No. 6, Aug. 11, 1851.

ACTION OF RED HEAT ON ALCOHOL AND ACETIC ACID.

BY M. MARCELLIN BERTHELOT.

THE vapor of alcohol, directed through a porcelain tube filled with pumice-stone and heated to redness, furnishes charcoal, gaseous hydrocarbons, naphthalime, benzine, phenic acid, and various other substances.

The naphthaline is obtained in the crystallised state; I did not determine its freezing point. It has, moreover, been noticed in the decomposition of alcohol, by Saussure and Reichenbach, and in that of Dutch liquor by M. Regnault.

The presence of benzine may be demonstrated by directing the gasses into fuming nitric acid. This is afterwards precipitated by water. The precipitated matter is endowed with a distinct odor of bitter almonds, an odor possessed by nitrobenzine. It furnishes with nascent hydrogen a mixture of naphthalidum and aniline. The aniline was detected by means of chloride of lime, which produced the characteristic violet coloration.

Finally, with the naphthaline, which it always accompanies, was condensed a volatile oil, drying on the epidermis, soluble in water and in ether, retained by soda, and furnishing picric acid by the action of nitric acid. This oil appears to be phenic acid.

The vapor of acetic acid, subjected to the same decomposition, in great measure resists red heat—a fact already noticed. A portion only is destroyed, producing charcoal, combustible gases, acetoine, naphthaline, phenic acid, benzine,&c. The above-mentioned process enabled me to prove the existence of the last three products.

From these facts it results that, by distillation through a red hot tube of substances of rather low equivalent, as alcohol and acetic acid, are produced the same hydrocarbons, and the same stable substances, which are so little alterable by heat, which we obtain in the distillation of complex matters, as coal and fat oils for example. These substances appear then to be constant essential products of every distillation at a red heat of a non-nitrogenous organic substance. It is by virtue of a peculiar affinity, a special molecular complication, that these products are developed. Their formula does not appear to be connected by a simple derivation with that of the matter decomposed. Their presence, moreover, does not imply identity in all cases of these distillations: it is thus that the decomposition of acetic acid and that of alcohol present quite a different physiognomy. These are essential, but not dominant products.

The experiment relative to acetic acid leads also to a very curious conclusion: viz., that the synthesis of these same substances. or to speak more correctly, the possibility of reproducing from the simple bodies of which they are composed, naphthaline, benzine, and, probably phenic acid, may be regarded as an accomplished fact. Indeed, they are obtained by means of acetic acid. Now, acetic acid may be made by several processes. To mention only one, the reaction by means of which M .Koble passes sulphuret to the state of chloride of carbon, thence to chloracetic acid, is well known, and it is also known that the latter, treated by the amalgam of potassium, has, in M. Melsens' hands, reproduced acetic acid.—*Comptes Rendus. No.* 7; 18 *Aug.* 1851.

ON THE WATER OF THE PACIFIC AND ATLANTIC OCEANS.

BY VON BIBRA.

THE samples of sea-water examined by the author, were taken in the first half of 1850, about noon, as it was easy by that time to know exactly the latitude and longitude of the spot from whence they were taken.

I. From the harbor of Calloa, (Peru),

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about half an English mile from the coast; s. lat. 12° 5′; long. 77° 14′ (Greenwich). Temperature of the water, 15° 1 R.; temperature of the air, 19·0 R.; state of the barometer in millimetres, 756·2. *March* 14, 1850.

II. From the harbor of Tocopilla (Algodon Bay) about a quarter of an English mile from the coast; s. lat. 22° 6′; long. 70° 15′. Sp. grav. 1·0278; temperature of the water, 13·9; temperature of the air 17·5 R.; state of the barometer, 755·6. *February* 21, 1850.

III. Pacific Ocean. From a depth of 70 fathoms (about 420 feet) during a perfect calm; s. lat. 25° 11′; long. 93° 24′. Sp. grav. 1·0264; temperature of the water, 16·5 R.; temperature of the air, 20·0 R. State of the barometer, 761·0. *March* 27, 1850.

IV. From the same spot, but as usual, 10 to 12′ below the surface. Sp. grav. 1·0260; temperature of the water, 19·4 R.

V. In sight of Diego Ramirez. Beyond Cape Horn, the farthest rocky island on the southern point of America; s. lat. 56° 32′; long. 68° 47′; temperature of the water, 5·8 R.; of the air, 6·9 R.; state of the barometer, 75·12. *April* 18, 1850.

VI. Atlantic Ocean; s. lat. 23° 45′; long. 29° 27′; sp. grav. 1·0244; temperature of the water, 19·5 R.; of the air, 19.5; state of barometer, 76·25. *May* 12, 1850.

VII. Atlantic Ocean, almost under the equator; s. lat. 0° 47′; long. 33° 20′; sp. grav. 1·0275; temperature of the water, 22° 2′ R.; of the air, 22° 5′ R. State of the barometer, 755·2. *May* 22, 1850.

VIII. Atlantic Ocean, n. lat. 20° 54′; long. 40° 44′; temperature of water, 20·2 R.; temperature of air, 20·0 R.; state of barometer, 763·1. *June* 4, 1850.

IX. Atlantic Ocean, n. lat. 41° 18′; long. 36° 28′; sp. grav. 1·0287; temperature of the water, 16·6 R.; of the atmosphere, 17·9 R.; state of the barometer, 764·0. *June* 18, 1850.

X. German Ocean, n. lat. 51° 9′; long. 3° 8′ (east of Greenwich); sp. grav. 1·0264; temperature of the water, 13·0 R.; of the atmosphere, 12·0 R.; state of the barometer, 75·86. *July* 5, 1850.

The following is a synopsis of the composition of these various specimens of water:—

	I.	II.	III.	IV.	V.
Chloride of sodium	2·4825	2·8391	2·5885	2·5877	2·6333
Bromide of sodium	0·0402	0·0441	0·0307	0·0401	0·0420
Sulphate of potassa	0·1409	0·1599	0·1418	0·1359	0·1327
Sulphate of lime	0·1488	0·1449	0·1622. .	0·1622	1·1802
Sulphate of magnesia	0·0947	0·1041	0·1117	0·1104	0·1079
Chloride of magnesium	0·3681	0·3852	0·4884	0.4345	0·3802
	3·2752	3.6773	3·5233	3·4708	3·4763
Water	96·7248	96·3227	96·4767	96·5292	96·5237
	100·0000	100·0000	100·0000	100·0000	100·0000

In the water of the Atlantic and German Oceans were found:

	VI.	VII.	VIII.	IX.	X.
Chloride of sodium	2·7558	2·7892	2·6424	2·9544	2·5513
Bromide of sodium	0·0326	0·0520	0·0400	0·0500	0·0373
Sulphate of potassa	0·1715	0·1810	0·1625	0·1499	0·1529
Sulphate of lime	0·2046	0·1557	0·1597	0·1897	0·1622
Sulphate of magnesia	0·0614	0·0584	0·0678	0·1066	0·0706
Chloride of magnesium	0·0326	0·3332	0·4022	0·3916	0·4641
	3·2585	3·5695	3·4746	3·8422	3·4383
Water	96·7415	96·4305	96·5254	96·1578	96·5617
	100·0000	100·0000	100·0000	100·0000	100·0000

Chlorine was found in very small proportion, in I., 0·0096; in II., 0·0102: in IV., 0·0098; in VIII., 0·1010; and in X., 0·0087.—*Ann. d. Chem. u. Pharm.*, Bd. lxxvii., and *Central Blatt*, No. 23, 1851, p. 362, and *Pharmaceutical Journal*.

ANALYSIS OF THE ALLANTOIC LIQUOR OF THE SHE ASS.

BY M. LANDERER.

I RECEIVED the amniotic and allantoïc liquors of a she ass for the purpose of subjecting them to chemical analysis. This liquor had a yellowish color, a very bitter and more or less rancid taste and had a very acid reaction with litmus paper; its specific

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gravity was 1·036. In evaporating this liquor, it disengaged a very disagreeable odor in which it was easy to perceive the presence of acetic acid, which was likwise detected by exposing the test paper to the vapor. The allantoïc liquor deposited a flocculent and very light precipitate which remained a long time in suspension; under the microscope it showed itself to be crystalline and contained carbonate and phosphate of lime. The flocks which floated in the liquor were allantoïn; this matter dissolved in alkaline solutions and the solution thus obtained produced in nitrate of silver a pulverulent white precipitate. The liquor separated from the flocks of allantoïn contained besides acetate of ammonia, chloride of sodium, sulphate of soda and yellowish organic matters, soluble in alcohol.—*Journal de Pharmacie et de Chimie*, August, 1851.

EXPERIMENTAL RESEARCHES ON THE ETHERS AND AMIDES OF THE FIXED ORGANIC ACIDS.

BY M. P. DEMONDESIR.

NEUTRAL ETHERS.—The processes employed for the isolation and purification of the neutral ethers, may be reduced to three general methods, based on distillation, washings in water, and crystallisation. The numerous bodies of this class already discovered, all possess, indeed, one, at least, of the properties which secure the success of these methods; all are either volatile, or sparingly soluble in water, or solid at ordinary temperatures; many combine several of these characters, which allows of corresponding methods being adopted for their preparation.

But should ethers exist which do not present any of these properties, the usual methods have not been able to discover them. It appeared to me that it would be natural to attribute to this cause the singular gap which occurs in the ethereal series of important acids, such as tartaric, paratartaric, and malic acids. Experiment has verified this hypothesis in the most complete manner. I have found that the alcoholic and methylic ethers of these acids are all liquid, are almost entirely destroyed by distillation, and mix with water in all proportions; the alcoholic ether of malic acid is the sole exception in this last respect, but its solubility is nevertheless so great, that the process of washing in water is quite inapplicable to it.

The method by which I have been able to obtain these bodies may be described in the following manner:

As a medium of etherification either sulphuric or gaseous hydrochloric acid may be used; but the latter is preferable, because it gives, in ordinary circumstances, less colored and more abundant products. Besides the presence of sulphorinates renders the subsequent purification more difficult.

To isolate the ether formed in this first operation, the acid liquor is neutralised by a carbonate, and it is agitated several times with sulphuric ether; this solvent removes the ether formed, and by distillation abandons it as residue.

The ether thus obtained still contains water, alcohol, or pyroxylic spirit, and salts; it is first deprived of the volatile bodies by the action of the vacuum or of gentle heat in the open air, and then of the salts by dissolving it in very pure sulphuric ether.

Such are the essential points of the general method, but to obtain the most abundant, least colored, and purest products, it is necessary to vary the details according to the properties of each ether, its affinity for water, and the series to which it belongs.

An ordinary preparation gives at least two thirds of the weight of the acid employed of pure ether, and the whole weight if the quantity of matter is considerable. These ethers are then formed as easily as the others, it is only their purification which presents any difficulties.

It may be supposed that to the new bodies mentioned in this note, and which are only the results of first trials, others will be added to form a class of which it is difficult, *á priori*, to foresee the extent.

But the employment of this method is not confined to ethers which are very soluble in water, and which the processes at present used cannot prepare. In the preparation of these bodies, sulphuric ether is sometimes employed as a solvent, and the acids saturated by carbonates; but it does not appear to me that these two principles have ever been combined to form a general process. Now the cases in which this proceeding would be advantageous, are, in my opinion, very numerous.

Every one knows how much loss is occasioned by washings, especially when operating on small quantities of matter. Now, for ethers which separate from water in the form of an oily layer, sulphuric ether possesses the property of absorbing it, even to the smallest trace which an aqueous mixture may contain, and the employment of it gives, consequently, without perceptible loss, the products formed in the

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etherification. For example, 250 grammes of citric acid etherified by sulphuric acid, give 15 grammes of citric ether when purified by washings in water. In a similar operation sulphuric ether removes as the definitive product, 75 grammes of ether. To this we may add that the substitution of hydrochloric for sulphuric acid, gives 200 grammes, that is to say, four-fifths of the weight of the citric acid.

For liquid ethers but little soluble in water, and of which the vapor tension is weak at ordinary temperatures, sulphuric ether becomes a true reagent which recovers the smallest quantities, and enables us to study the laws of their formation.

ETHERISED ACIDS.—In the preparation of the neutral ethers from citric and malic acids, there are, besides, produced acid ethers.

Malic acid gives rise to malovinic and malomethylic acids, the salts of lime of which are soluble in alcohol.

Citric acid produces at least one vinic acid presenting the same character. In the methylic series the neutral ether is remarkable for its stability and beautiful crystallisation. The preparation of citrobimethylic acid is very easy; citromonomethylic acid, which is always produced at the same time in variable proportions, may be easily separated either from the preceding or from citric acid, for its salt of lime is very soluble in water, and insoluble in alcohol; whereas citrobymethylate of lime dissolves readily in the latter liquid.

All these etherised acids are very easily produced by the direct action of the primitive acids on alcohol and pyroxylic spirit. According to my experiments, the same method is advantageous in preparing the analogous combinations of oxalic acid.

AMIDES.—The neutral ethers lead us directly to the amides. The carefully managed action of ammoniacal alcohol on tartaric ether of alcohol gives tartramethane or tartramic ether, which when decomposed with care by alkalis, furnishes tartramic acid, very soluble in water and alcohol. By prolonging the action of the ammonia, the tartramethane is transformed into tartramide.

The same reagent acting on citric ethers, besides several intermediary products whose formation is evident, but which have not yet been well isolated, leads to citramide as a definitive product in the two series of alcohol and pyroxylic spirit.

Finally, malic ether, in the same circumstances, gives malamide, the composition of which does not differ from asparagine; many characteristics common to these two bodies appear to establish between them an identity which only profound researches can render certain.

These three amides are but little soluble in cold water, and crystallise with regularity.

The ethers and amides of tartaric and malic acids act on polarised light. Tartramide above all possesses this property in a remarkable degree.

All the bodies mentioned in this note have been analysed, their compositions are in accordance with those of analogous bodies, and are such that is is easy to recognise them after the numerous examples already known.—*Comptes Rendus. No.* 8, *August* 25, 1851.

II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

RESEARCHES ON THE NUTRITION OF OATS, PARTICULARLY AS REGARDS THE INORGANIC MATTERS WHICH ARE NECESSARY FOR THEIR NUTRITION.

BY THE PRINCE OF SALN HORSTMAR

THE first series of our researches was published in 1848 in Esdmann's *Journal für praktische Chemie*, Vol. XLVI, p. 193 [See THE CHEMIST, New Series, Vol I (1849-50) page 24.] We caused the plants on which we experimented to vegetate in a soil composed of sugar charcoal. But the objection somewhat naturally entertained to the abnormal character of such a soil, and the recomendations of Baron Humboldt, have led us to resume and continue our experiments, by operating sometimes on calcined sand, and sometimes on the coarse powder of rock crystal, and, to complete our experiments in artificial silicic acid and in other media to which various additions are made.

These new experiments were made in vessels entirely composed of purified white wax. Formerly the vessels in which we operated were of glass simply covered on the inside with a layer of wax; but we remarked that this layer did not entirely prevent the contact of the roots with the sides of the vessels, because, soon after

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a damp soil had been deposited in them, small cracks or crevices were formed in the layer of wax, and thus left a passage open for the roots. In consequence of this inconvenience we have given the preference to vessels composed of wax. These vessels were of cylindrical form, 6 centimetres high and 3 in diameter, and easily contained 60 grammes of sand. We were obliged to stop at these dimensions, which will, perhaps, be thought rather small, on account of the experiments which we desired to perform with powdered rock crystal.

The vessels were constructed in the following manner:—a wooden cylinder was covered with oiled paper, then placed on an even surface of porcelain; it was enveloped with another cylinder, made of pasteboard of sufficient diameter for an annular space of determined size to remain between the two surfaces; the internal surface of the pasteboard cylinder was covered with oil, and then the annular space was filled with melted wax. After cooling the wooden cylinder and the pasteboard cylinder were removed, and left exposed a cylinder of wax, to which a bottom, likewise of wax was adapted.

The matters added to the sand and other media, which in the following experiments are not stated to have been dissolved in water, were powdered together, and in the dry state in an agate mortar, and then carefully mixed with the principal mass in a porcelain capsule; the whole was afterwards moistened with a dilute solution of alkaline silicates, then mixed again, introduced into the wax vessel and watered with a dilute solution of nitrate of ammonia (in the cases where the latter was employed) finally, the grain of oat was placed in such a manner that its point was on a level with the surface of the soil, and as much distilled water as the mass could absorb was added drop by drop. In those experiments in which the silicate of potassa was *previously* mixed with nitrate of ammonia, in order to at once get rid of the ammonia which became free, we commenced by heating, then half of the liquor was mixed with the dry mass which was afterwards introduced into the vessel, after which, it was watered with the other half of the liquor to which was added as much water as the mass could absorb.

The sand which was chosen for the experiments was that of Königslutter, near Brunswick. It was preferred to any other because it is impossible to procure perfectly pure quartz sand, and because the composition of the sand of Königslutter is indicated in the Notice of Wiegmann and Polsdorff *On the Inorganic Parts of Plants*.

The powder of quartz and rock crystal employed in the experiments, when it was required to operate on materials of great purity, was obtained by bruising fragments among them, after having enveloped them in paper. There was thus obtained a powder from which were carefully removed all traces of paper, and the largest of whose particle did not exceed in size a seed of colza.

The experiments with calcined river sand served as counter proofs, seeing that we were already assured of the complete and normal fructification of oats in this medium provided with additional and determinate matters. These counter proofs had not only the object of controling the effects of the additional matters in the other experiments, but also of making known the influence of the seasons. The river sand contained chloruretted combinations from which it was very difficult to free it, after calcination, by washing with water, but which were finally eliminated by boiling with hydrochloric acid.

The silicate of potassa which was used in the experiments was produced by fusing uncalcined silica with carbonate of potassa, and treating the vitreous mass by prolonged digestion in warm water. Weighed and determinate quantities of this solution were taken for each experiment. The silicic acid was obtained by treating rock crystal with carbonate of potassa and afterwards by nitric acid.

The carbonate of lime employed as an addition was obtained by precipitation from nitrate of lime by means of carbonate of ammonia. The greatest care was taken to purify the nitrate of lime from all traces of chlorine and magnesia.

The phosphate of lime was precipitated from phosphate of ammonia by nitrate of lime.

The carbonate of magnesia was precipitated from the pure sulphate by means of carbonate of potassa.

The oxide of iron employed was obtained by *successive precipitation* from dilute solutions of basic chloride of iron with succinate of ammonia which was as neutral as possible; it was afterwards returned to the state of chloride and evaporated; it was converted into nitrate and precipitated *denovo* by succinate of ammonia. The succinate of oxide of iron was introduced into a covered crucible and was heated to complete calcination. This carbonate of oxide of iron, (probably mixed with a little reduced iron), was, as much as possible purified from the presence of manganese; we will designate it by the name of *magnetic oxide*.

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The alumina was prepared by the crystallisation of very fine potash-alum, by the precipitation of this salt by digestion with an excess of carbonate of potassa, by solution in nitric acid, and, finally, by a fresh precipitation by means of ammonia. Notwithstanding the most careful washings, this alumina was never freed from all traces of potassa and nitric acid.

In each experiment, the principle substance which formed the basis of the artificial soil was fixed at an equal volume to that of the 60 grammes of sand. When there were exceptions they are pointed out. The following experiments were made with the common white oat, in an inhabited room exposed to the south. The plants were watered with distilled water.

NO I. CALCINED SAND OF KÖNIGSLUTTER.

Without any additional substance.

Growth languishing, regular; five leaves; green color.

Stem 32 centimetres high; two flowers one fruit. No lateral shoot.

No II. UNCALCINED SAND OF KÖNIGSLUTTER.

Without additional inorganic substances.

0·038gr. of nitrate of ammonia dissolved in 17 grammes of water.

Stem 56 centimetres high; languishing, inclined; six leaves, color deep green.

Three flowers, two fruits (very small); no lateral shoot.

The formation of two fruits was evidently due to the sand used in this experiment not having been calcined.

No. III. POWDER OF CALCINED QUARTZ.

Without additional inorganic substances.

0·038 of nitrate of ammonia dissolved in 17 grammes of water.

Stem 4 centimetres high; four leaves, no flowers; color pale green.

An accidental circumstance would seem to have have acted here, *if the sand of the second experiment* had been completely free from silicates.

NO. IV. KONIGSLUTTER SAND CALCINED.

Without additional nitrogenous substances.

gr.
0·035 silicic acid.... } dissolved in 17 grammes of water in the state of silicate of potassa.
0·018 potassa.....

0·1 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia
0.025 magnetic oxide of iron.

Stem 32 centimetres high, very languishing; five leaves; coloration bright green.

One incomplete flower, without fruit.

One lateral shoot.

NO. V. SAND OF KONIGSLUTTER BOILED WITH HYDROCHLORIC ACID, WASHED AND AFTERWARDS CALCINED.

Without lime.

gr.
0·035 silicic acid.. } in the state of sili-
0·018 potassa..... } cate of potassa.
0·02 carbonate of magnesia.
0·03 phosphate of ammonia and magnesia.
0·02 sulphate of potassa
0·025 magnetic oxide of iron
0·028 nitrate of ammonia dissolved in 1 gramme of water, mixed and then heated with the silicate of potassa dissolved in 7 grammes of water, until the ammonical odor had in great measure disappeared; after which water was added until the whole had attained the bulk of 17 grammes of water.

When the second leaf was developed, the first was dead, and the plant perished before the developement of a third leaf.

Neither stem nor flower.

NO VI. WHITE QUARTZ BOILED WITH HYDROCHLORIC ACID, WASHED AND CALCINED.

gr. *Without addition of lime*
0·035 silicic acid } in the state of silicate
0·018 potassa .. } of potassa.
0·02 carbonate of magnesia.
0·03 phosphate of ammonia and magnesia.
0·02 sulphate of potassa.
0·025 magnetic oxide of iron.
0·001 carbonate of protoxide of manganese
0·028 nitrate of ammonia mixed with silieate of potassa, heated, &c, &c, as in No. V.

Death after the second leaf, before the third leaf was developed.

Neither stem nor flower.

NO VII. SAND OF KÖNIGSLUTTER BOILED WITH HYDROCHLORIC ACID, WASHED AND CALCINED.

gr.
0·035 silicic acid.. } silicate of potassa.
0·018 potassa .... }
0·01 carbonate of lime.
0·03 phosphate of lime.
0 03 sulphate of lime.
0·025 magnetic oxide of iron
0·028 nitrate of ammonia mixed with silicate of potassa, and treated like No V.

Stem 40 centimetres high, inclined, languishing: six leaves; color yellowish green.

Two stunted flowers, without any fruit.

Three lateral shoots which appeared at the same time that the stem perished.

NO VIII SAND OF KONIGSLUTTER BOILED WITH HYDROCHLORIC ACIE, WASHED AND CALCINED.

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Without potassa.

gr.
0·05 hydrated silicic acid.
0·1 carbonate of lime.
0 03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·025 magnetic oxide of iron.
0·028 nitrate of ammonia dissolved in 17 grammes of water.

Stem 22 centimetres high, very languishing, inclined; six leaves of a pale green, with rough edges.

One flower, no fruit; no lateral shoot.

NO. IX. WHITE POWDER OF QUARTZ BOILED IN HYDROCHLORIC ACID, WASHED AND CALCINED.

Without silicate of potassa.

The same matters added as in the eighth experiment, with the exception of the hydrated silicic acid which was replaced by 0·001gr. of carbonate of protoxide of manganese.

Stem 8 centimetres high; six leaves; color of the four lower leaves green, and of the other two yellower.

The preceding leaf died when the succeeding one was developed. No flowers.

NO. X. SAND OF KONIGSLUTTER BOILED WITH HYBROCHLORIC ACID, WASHED AND CALCINED.

Without phosphoric acid.

gr.
0·035 silicic acid... } silicate of potassa.
0·018 potassa ..... }
0·1 carbonate of magnesia.
0·03 sulphate of lime.
0·02 carbonate of lime.
0·025 magnetic oxide of iron.
0·028 nitrate of ammonia, mixed with silicate of potassa, heated and treated as in No. V.

Stem 51 centimetres high; languishing, slightly inclined curved; five leaves of a pale green color; two flowers, one of which was imperfect; no fruit; one lateral shoot.

NO. XI. SAND OF KÖNIGSLUTTER BOILED WITH HYDROCHLORIC ACID, WASHED AND CALCINED.

Without sulphuric acid.

The same bodies added as in the tenth experiment, except the sulphate of lime which was replaced by 3 centigrammes of phosphate of lime.

Stem 4 centimetres high; three leaves, the third of which remained filiform and contracted; it died before the fourth leaf begun to be develcped.

One lateral shoot nearly as high as the stem.

NO. XII. SAND OF KONIGSLUTTER BOILED WITH HYDROCHLORIC ACID, WASHED AND CALCINED.

Without iron.

gr.
0·035 silicic acid } silicate of potassa
0·018 potassa... } dissolved in 17 grammes of water.
0·1 carbonate of lime.
0·04 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·04 nitrate of ammonia dissolvsd in 15 grammes of water, with which the mass introduced into the vessel, after having been intimately mixed, was watered.

Stem 20 centimetres high, languishing, inclined; first leaf green; second and third leaves yellower; the subsequent leaves were of a pale color, as if they had been deprived of the action of light.

No joints issued from the sheath of the leaves. No flowers, but two embryo flowers contained in the transpareut sheath, which they had not penetrated. One lateral shoot, after the appearance of which, the growth of the principle stem stopped.

NO XIII. POWDERED ROCK CRYSTAL, CALCINED.

Without iron.

0·017gr. silicic acid } silicate of potassa
0·009 potasssa.. } dissolved in 5 gr. of water.
0·2 carbonate of lime.
0·04 phosphate of lime.
0·04 sulphate of lime.
0·03 carbonate of magnesia
0·02 nitrate of ammonia dissolved in 5 grammes of water, mixed with the solution of silicate of potassa, and the whole heated until the ammonical odor had disappeared.

Stem 35 centimetres high, curved, languishing; six leaves, the first of which was green the following four were of a pale yellow with green sheaths; the sixth was greeu but very short. The leaves had rough edges. All the joints remained in the sheaths.

Three flowers of green color; one very small fruit; one lateral shoot. The fruit had undergone the germinative process, the effects of which had been rather slow.

NO XIV. POWDER OF ROCK CRYSTAL, CALCINED.

Without Iron.

(0·035) silicic acid } Silicate of potassa
0·018 potassa..... } dissolved in 12 grammes of water.
0·1 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
(0·07) nitric acid of 26·3, diluted with 4

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grammes of water, and afterwards mixed with the solution of silicate of potassa; as, in this mixture, a slight acid reaction was manifested, a little silicate of potassa was added until there was a slight appearance of an alkaline reaction. Of this solution, thus prepared, only half, diluted with 10 grammes of water, was added to the mass.

Stem 41 centimetres high, inclined, languishing; six leaves, the first and sixth of which were green, and the others very pale and rather yellow than green; in the middle of the fourth leaf was a brownish longitudinal band; the fifth was covered with rust, the edges of the leaves were of a proper degree of roughness: the last leaf was very short.

One flower, one perfect fruit. The germinative process was slow in its developement.

NO XV. POWDER OF CRYSTALLISED QUARTZ, CALCINED WITH POWDERED BONE.

Without iron.

gr.

0·026 silicic acid } silicate of potassa dissolved in 15 grammes of water.
0·013 potassa...

0.1 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0.2 powder of fresh bones of the ox.

The first leaf of abnormal conformation, green; the second leaf was developed very slowly. No third leaf; but from the neck of the roots issued a lateral shoot 8 centimetres long, with 4 very meagre leaves, of a doubtful green, which died very soon after their developement. No flower.

This plant was moved. To the medium in which it had vegetated were added 25 milligrammes of magnetic oxide of iron and 1 milligramme of carbonate of protoxide of manganese, which were very carefully mixed with the mass, and another seed was placed in it. A stem 35 centimetres high grew from it, with five leaves of a bright green. The stem, which was languishing, but of normal conformation, bore 1 flower without fruit: at its side were formed two lateral shoots.

The meagre growth of this last plant appears surprising when we regard the fertilising powers of the powdered bone, even in the lightest sands, and in the quantity of 2 decigrammes of this substance, which constitutes here, in relation to the medium of vegetation, a rich manure. This peculiarity must doubtless be attributed to the powdered bone, which serves as a manure in fields, being previously watered and left in a heap until it heats and gives out an ammoniacal odor, that is to say until fermentation has commenced, which was not done in the present case.

NO. XVI. POWDER OF CRYSTALLISED QUARTZ CALCINED.

With oxide of iron free from manganese.

gr.

0·035 silicic acid } silicate of potassa dissolved in 17 grammes of water.
0·018 potassa...

0 01 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·025 magnetic oxide of iron perfectly free from manganese.
0·016 nitrate of ammonia dissolved in 7 grammes of water.

The oxide of iron was not mixed with the mass as in the other experiments; it was simply deposited at the bottom of the vessel. After the fourth leaf was half developed, there appeared, on the third leaf, traces of a brownish stain; the stained portion of the leaf seemed as if it had been dried. (These stains very much resembled those which made their appearance on the oat-plants raised in sugar charcoal mixed with too large a proportion of iron.) When the sixth leaf had reached its full developement, the brownish stain of the third leaf occupied a length of 5 centimetres at the base of the leaf, and occupied its entire breadth. Afterwards, similar stains were developed on the third, fifth and sixth leaves; they were greatest on the last; besides, it was slightly distorted.

NO. XVII. POWDER OF CRYSTALLISED QUARTZ CALCINED.

With oxide of iron free from manganese.

The substances here added were the same as in No. XVI, with the difference that 4 centigrammes of nitrate of ammonia were dissolved in 2 grammes of water and mixed with the silicate of potassa dissolved in 10 grammes of water; the whole was heated until the ammoniacal odor had disappeared, and then sufficient water was added to make 17 grammes of liquid.

Instead of being deposited at the bottom of the vessel, the oxide of iron was carefully mixed with the entire mass.

Stem 49 centimetres long, normal and vigorous; six leaves of a bright green; six comp'ete flowers, without fruit; two lateral shoots.

NO. XVIII. POWDER OF ROCK CRYSTAL, CALCINED WITH PHOSPHATE OF IRON, WITHOUT MAGNESIA.

0·035 silicic acid } silicate of potassa dissolved in 10 grammes of water.
0·018 potassa...

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0·1 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime
0·02 carbonate of magnesia.
0·05 phosphate of iron, dried at a gentle heat, reduced to a fine powder, mixed with the rock crystal; the whole was calcined together.

0·04 nitrate of ammonia dissolved in 2 grammes of water; this liquid was mixed with the solution of silicate of potassa, heated until the greater part of the ammonia was volatilised, and brought by the addition of water to the volume of 17 grammes.

Stem 49 centimetres high, vigorous; six leaves of a deep green, without stains; six flowers, one of which was stunted; no fruit.

Two lateral shoots, one issuing from the lowest joint, the other from the one above it; these shoots showed themselves, as in most of these experiments, only when the flowers appeared on the principal stem, and when proper fructification had not taken place.

NO. XIX. POWDER OF ROCK CRYSTAL, CALCINED.

With manganese and oxide of iron.

gr.
0·035 silicic acid } silicate of potassa
0·018 potassa... } dissolved in 10 grammes of water.
0·1 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·025 magnetic oxide of iron.
0·001 carbonate of protoxide of manganese

0·038 nitrate of ammonia dissolved in 1 gramme of water, mixed with the solution of silicate of potassa, heated and diluted as in No. XVIII.

Stem 50 centimetres high; six leaves of a deep green, without stains; five flowers, without fruit; two lateral shoots.

NO. XX. POWDER OF ROCK CRYSTAL, CALCINRD.

With less iron, with manganese.

gr.
0·035 silicic acid } silicate of potassa
0·018 potassa... } dissolved in 7 grammes of water.
0·2 carbonate of lime.
0·04 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·01 magnetic oxide of iron.
0·001 carbonate of protoxide of manganese.

0·028 nitrate of ammonia dissolved in 1 gramme of water, mixed with the solution of silicate of potassa, and heated; sufficient water was added to bring the bulk to 17 grammes, as in No. XVIII.

Stem 42 centimetres high; five leaves of a pale green, with yellow stripes, caused by *the diminution of the iron.*

Four flowers, without fruit; two lateral buds, which appeared when the plant began to to flower.

(To be continued.)

ON NITRATE OF SODA AS A TOP-DRESSING OF WHEAT.

BY PH. PUSEY, ESQ., M.P., MEMBER OF THE ROYAL ACADEMY OF AGRICULTURE AT STOCKHOLM.

HAVING read that some very good farmers in Norfolk make a practice of top-dressing their wheat in spring with nitrate of soda, I determined once more to try this salt, which, as the older members of our Society will remember, was once a very fashionable manure, but the use of which was discontinued by its advocates in consequence of its tendency to lay the corn and to produce mildew. Thess two serious faults, it now appears, may be corrected by mixing with the nitrate a moderate quantity of common sea-salt—which, when used in heavy doses, destroys the life of grass—and may therefore be readily supposed to counteract the dangerous suddenness of vegetation that nitrate produces. Thus common salt may prevent mildew, and is known certainly, on some soils, to strengthen the straw. The nitrate was sown as directed at the rate of one cwt. per acre, mixed with one cwt. of common salt; but this quantity was not given at once, being divided as enjoined into two doses, applied at a fortnight's interval and in showery weather. It was so applied to a 10-acre piece of white wheat, a portion thereof being, however, passed over. The whole produce has been threshed out already, in order to test the effect; a portion was top-dressed, not with nitrate, but guano. The result is as follows—

	Bushels per acre.	Increase in bushels.	Cost of dressing.	Value of increased produce.
			s.	*s.* *d.*
Undressed.....	21	..	..	..
Guano, 2 cwts.....	24	3	20	15 0
Nitrate, 1 cwt., and salt, 1 cwt.....	25½	4½	17	22 6

The other trial was made on an 8-acre piece of red wheat following barley. The wheat had begun to appear very blue and spindling, notwithstanding a good coat of dung given it in the autumn, to make up

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for cross cropping. The improvement was immediate, and has stood the test of threshing, for the account is as follows. Two acres were threshed, one on each side adjoining the half acre in the middle on which no nitrate of soda was sown.

	Bushels per acre.	Increase in bushels.	Cost of dressing.	Value per acre of increased produce.	Profit per acre.
			s.	*s.*	*s.*
Undressed	19⅔	..	..	..	..
Nitrated..	27⅓	8⅔	17	42	25

The profit on this piece is certainly more than the value to rent of the land, which is poor blowing sand. The theory of this action is now clearly established hy Mr. Lawes's experiments, for nitrogen, whether as ammonia in guano or whether in a nitrate, is proved to be the food generally wanted by wheat. Mr. Way informs me that nitrogen is now rather cheapest in guano, but it does not appear to be so effective as a top-dressing, possibly because in guano it is volatile and not so in nitrate. Clearly as there is no limit to the beds of nitrate in the plains of Peru, it will be a great advantage if we can thus hope to deal with the most unfortunate monopoly of guano, for with a large demand for nitrate there can be no reason why we should not obtain a cheaper supply.

As to the practical application of nitrate with salt, I speak with diffidence, but I should look to it more for curing defects in a crop arising from season or from poverty of soil than for raising a good crop to a very high figure upon good land. Indeed in looking over the experiments made 10 years ago, I find that nitrate sometimes does not act at all upon good land.

We all know, however, how apt wheat is to turn off from frosts or from wireworm in February, and I do not think it would be at all rash to say that nitrate, used with judgment in such cases as a cordial to the sick plant, would almost enable us to control this source of uncertainty in the yield, and raise 20 bushels to 28, as it did with me, at a very moderate cost certainly for an extra quarter of wheat.

Above all I think nitrate may be most valuable upon cold undrained clays, as we know it indeed to have been. I do not of course mean that any clays should remain undrained—but many are undrained, and for want of funds are likely long to remain so. It is an old practice on heavy undrained land to dress the chilled wheat near the furrows with pigeon's dung. The nitrate would act in the same manner. Our forefathers were limited in such applications by their very narrow supply of artificial manures containing nitrogen, doves' dung only, or soot. It is the feature of the last 10 years that wide beds of nitrate, and now of phosphates, whole pyramids too, one may say, of guano, have been laid open to us. Their practice, therefore, should widen in our hands as our resources have widened.

Pusey, August 21, 1851.

ON JATROPHA MANURE.

BY THORNTON J. HERAPATH, ESQ.

To the Secretary of the Royal Agricultural Society.

SIR,

MY object in addressing these few lines to you is to call your attention, and that of the members generally, to a new description of manure, which has been recently brought before my notice. I allude to the "Jatropha manure," as it is called. This is the expressed cake of the "lamp-oil seed," the fruit of a variety of the castor-oil plant, *(Ricinus communis*, var. *Major,)* which is imported in pretty considerable quantities from the Cape de Verde Islands, &c., and which, when subjected to pressure, furnishes an oil admirably adapted for the purposes of illumination, and for lubricating machinery.

The oil being excessively purgative and poisonous, however, it has been found impossible to employ the residuary cake, which of course still contains a portion of oil, for the feeding of cattle, for which purpose it would be otherwise well adapted. The only use, therefore, the manufacturers can put it to, is to sell it to the agriculturists as a manure.

Some of this Jatropha manure was recently sent to my father, Professor W. Herapath, for analysis. It was examined in our laboratory, and found to contain in 100 parts :—

Water	10·24
Organic matters	81·88
Ashes	7·88
	100·

Nitrogen per cent. in fresh cake	4·20
,, ,, dried cake	4·68

The composition of the ashes was as follows:

		Per cent. of ash.
Soluble salts	0·048 =	6·193
Carbonates	1·66 =	21·070
Insoluble phosphates	4·22 =	53·554
Silica, grit, &c.	1·52 =	19·183
	7·88	100·

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Below is given a table containing analyses by MM. Soubeiran and Girardin of the cakes of the various oleaginous seeds.

Matters contained in 100 parts of oil-cake :—

	Pistachio.	Camelina.	Hemp.	Colza.	Beech.	Linseed.	Poppy.	Sesamum.
Water.....	12·0	14·5	13 8	13·2	14·0	11·0	11·0	11·0
Oil.....	12·0	12·2	6·3	14·1	4·0	12·0	14·2	13·0
Organic matters	71·0	65·1	69·4	66·2	75·8	70·0	62·3	66·5
Ashes, or Mineral salts.	5·0	8·2	10·5	6·5	6·2	7·0	12·5	9·5
	100.	100·	100·	100·	100·	100·	100·	100·

In the organic matters of the seed there was of—

Nitrogen.....	6·07	5·57	6·20	5·55	4·50	6·00	7·00	5·57

In the ashes there were—

	Pistachio.	Camelina.	Hemp.	Colza.	Beech.	Linseed.	Poppy.	Sesamum
Soluble salts....	0·27	0·098	0·577	0·13	0·124	0·70	0·62	0·57
Phosphates reckoned as bone phosphate....	1·20	4·200	7·100	6·50	2·100	4·90	6·30	3·20

Now, upon comparing the results of our analysis with those just given, it will be seen, that although the expressed cake of the Ricinus is certainly not so rich as many there named, still the proportion of fertilising ingredients it contains is far from being contemptible. And, if it be true, as MM. Boussingault and Payen assert, that the value of a manure is in direct proportion to the quantity of phosphoric acid and nitrogen it contains, then there can be no doubt that the Jatropha manure will ultimately prove a most useful and valuable fertiliser. No experimental trial, however, so far as I am aware, has been made with it, and consequently we do not as yet know how far experiment will bear out the deductions of science.

I remain, Sir, your obedient Servant,

THORNTON J. HERAPATH.

Mansion House, Old Park, Bristol,
July 25th, 1851.

EMPLOYMENT OF PICRIC ACID IN BEER AS A SUBSTITUTE FOR HOPS.

BY M. DUMOULIN.

M. DUMOULIN has presented to the Academy of Sciences a sample of beer, into which, instead of hops, he has introduced picric acid. The preparation of this beer, says the author, was begun in the commencement of last April, and the brewer who assisted has very carefully watched all the phases of this operation. He has likewise proved that the progress of the fermentation is perfectly regular, and it is impossible to distinguish it from that which takes place with beer made with hops. The new process is very economical, as 25 centigrammes of picric acid suffice for a hectolitre of beer. M. Dumoulin thinks that this beer will be preferable to ordinary beer for the navy; picric acid having anti-scorbutic properties.—*Journal de Pharmacie et de Chimie, August*, 1851.

[* For the Memoir of M. Soubeiran and Girardin, on the Cakes of Oleaginous Seeds see THE CHEMIST, New Series, Vol. II., (1850-51) pp. 312, 365.]

ON GAMBOGIC ACID AND THE GAMBOGIATES, AND THEIR USE IN ARTISTIC PAINTING.

BY DR. SCOFFERN.

THE author described the composition of gamboge as a gum-resin, and stated that some years since he had proposed the use of a preparation of it for oil-painting. For this purpose he employed methods to get rid of the gum. To obtain the gambogic acid he recommended æther to be employed when the coloring matter is dissolved, and by distillation the æther is given off; the last portions however are retained with so much force that a temperature of 230° or 240° was required and this would destroy the color unless water was employed with the ether. About one-twentieth of water was previously added to the etherial solution of the pigment or gambogic acid. The gambogiates of lime and other bases were under examination; the gambogiates of iron however produced a rich brown, like asphaltum, but capable of more richness and certainty in oil. From the trials made, the yellow and brown seemed to be permament colors, having useful properties as oil-colors. He also thought they might usefully be employed in fresco.—*British Association; from The Athenæum.*

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ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.*

Improvements in the manufacture of sheets of papier-maché or substances in the nature thereof. CHARLES FREDERICK BIELEFIELD, of Wellington Street North, Strand, papier-maché maker. Patent dated February 24, 1851.

The methods usually adopted when manufacturing sheets of papier-maché have been to paste together a number of sheets of paper until the requisite thickness is obtained, or to take a number of sheets of pulp from the frame, and laying them one on the other, to compress the whole between felt, for the purpose of expressing the water; and sometimes, when the sheets have not been required of very great thickness, the pulp has been run direct into frames of the required depth. Now the present improvements consist in making such sheets by rolling or compressing fibrous and other materials, ground to a putty-like consistence,, into frames of the required depth, in a manner similar to what has been hitherto practised when forming moulded articles of papier-maché, and then treating such sheets with heat and oil, as has been formerly practised in treatment of articles made of papier-maché. The sheets of papier-maché when so made, may be painted and varnished, or japanned in the ordinary manner; or they may have coloring matter introduced among the materials employed in producing them. The patentee describes a method of making a paste with fibrous and other materials, to be employed in manufacturing sheets according to his invention, which, however, he does not claim, as others may be adopted if preferred. To make this paste, he takes 80 lbs. water, 32 lbs. flour, 9 lbs. alum; 1 lb. copper; and to these, when mixed, he adds 15 lbs. resin, dissolved in 10 lbs. boiled oil, and 1 lb. of litharge; he subsequently grinds the mixture up with 55 lbs. to 60 lbs. rag dust (for which paper-makers' half-stuff may be substituted), and thus obtains a paste of the consistence of putty, suitable for rolling or pressing into sheets as above mentioned.

Claim.—The mode described of manufacturing sheets of papier-maché and substances in the nature thereof.

For certain improvements in the manufacture of hats, caps, bonnets, and other coverings for the head. JOHN HINKS, of Birmingham, manufacturer, and JAMES VERO, of Burbage, manufacturer. Patent dated February 24, 1851.

Claims.—1. The waterproofing felt of hats, caps, bonnets, and other coverings for the head, without altering the appearance or diminishing the flexibility of the same, by applying thereto a solution either of caoutchouc or India-rubber, or of gutta percha, or both.

2. The waterproofing of the bodies of hats, caps, bonnets, and other coverings for the head made of felt, to be covered with velvet, silk, or other plushes or fabrics, so as to preserve the flexibility of the same, by treating them with a solution of caoutchouc or gutta percha, or both in combination.

3. The waterproofing of japanned and painted felt hats, caps, bonnets, and other coverings for the head, without destroying the flexibility of the same, by treating them with a composition of whiting and lamp-black mixed in water, with the addition of boiled linseed oil and solution of India-rubber in oil of turpentine, and subsequently varnishing them with a composition of asphalte and resin, or pitch, dissolved in boiled linseed oil, and mixed with a solution of India-rubber in oil of turpentine.

4. The covering of hats, caps, bonnets, and other similar articles, by attaching thereto knitted coverings of silk or other suitable material, stretched so as to envelope the article without requiring a seam to be made.

5. The making of the bodies of hats, caps, bonnets, and other coverings for the head, of knitted fabrics treated with a flexible waterproof composition.

Certain processes for increasing on manufactured fabrics the several shades of indigo. VICTOR HYACINTHE LIBERT GUILLOUET, of Condé sur Noirot Calvados, France, chemist. Patent dated March 10, 1851.

This invention consists in subjecting textile fabrics dyed with indigo to the action of an elevated temperature under steam pressure.

Indigo is a substance naturally insoluble, and in order to fix it when used as a dye for manufactured fabrics, it must be rendered solmble, which is effected by means of disoxygenating agents, such as sulphate of iron and oxide of calcium. Then, by immersing the articles in such solutions, different shades of color may be obtained, varying in intensity according to the duration of their immersion. Indigo is also of a volatile nature, and this is one of its distinctive peculiari-

*Collected from *The Mechanic's Mag.*

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ties. The patentee proposes to avail himself of this volatile principle by subjecting the dyed fabrics to the action of an elevated temperature, under a certain pressure, in metallic vessels closed air-tight, and sufficiently strong to resist the internal pressure necessary for acting on the atoms of the indigo, and causing them to be fixed and amalgamated with the fibres of the manufactured articles, and to produce a change in their physical constitution. The form of the vessel employed is immaterial, but it is necessary that it should be provided with a safety-valve and a blow-off cock for expelling the atmospheric air when the steam is first admitted. The fabrics to be operated on, having been previously dried of any required pattern, are placed in layers in the vessel on a wooden framework, and enveloped in a blanket, for the purpose of preventing contact with the sides of the vessel, and to absorb the vapors produced by the first application of steam, which is then admitted at a pressure varying from two to six atmospheres. At the expiration of from twenty to thirty minutes, the cover of the vessel is raised, and the fabrics are withdrawn; and, after allowing them to cool they will be in a fit condition to be folded and packed. The effect of this operation on the indigo color will be to impart to it a violet tinge; nor will any detrimental effect be produced on other colors with which the goods may have been dyed; on the contrary, their richness and brightness will be rather increased. The cloth will be found to have undergone a material diminution in length, but the shrinkage in width will be hardly perceptible: it will at the same time have assumed a closer and finer texture, and will have become thicker and softer.

Claims.—The subjections of textile fabric dyed with indigo, to the action of an elevated temperature under steam pressure, for the purpose of increasing the shades of color in the said fabrics.

For improvements in moulds for electro-metallurgy. CHARLES COWPER, of Southampton Buildings, Chancery Lane. (A communication.) Patent dated February 17, 1851.

This invention consists in constructing moulds for electro-metallurgical purposes by the employment of gelatine, glue, or other glutinous or elastic material in combination with metallic wires, or strips or pieces of metal imbedded therein, by which the electric current may be quickly and simultaneously conveyed to all parts of the surface of the mould. When making moulds of gelatine or glue, the surface of the model is first oiled all over, and covered with a number of fine metallic wires, or strips or pieces of metal, the ends of which should be allowed to project; melted glue or gelatine is then poured on so as to imbed the wires, and allowed to cool, when a mould will be obtained suitable for use. The interior of the mould is rubbed over with black lead or covered with foil, and the exterior varnished or oiled before immersing it in the bath. When immersed, the mould is connected to one wire of the battery, and a piece of metal to the opposite wire; or, the mould may be connected directly to a piece of metallic zinc when using the apparatus known as the single cell battery. When the moulds are made of gutta percha, it is preferred to mix with it naptha or some other solvent. and to roll it into sheets, which are warmed and applied to the surface of the model—previously covered with fine wires, as above described. India-rubber moulds are obtained in the same manner, the India-rubber being previously treated with bisulphuret of carbon or other solvent, and rolled into sheets; or, the India-rubber may be dissolved and a mould obtained by applying successive coats of the solution to the model—one coat being in all cases allowed to dry before another is laid on. Moulds constructed as above described are particularly suitable for operating on metallic articles.

Claim.—The forming of moulds for electro-metallurgy by covering the models with metallic wires, strips, or pieces of metal, and applying the gelatine or other elastic or glutinous material to form the mould in such manner that the wires or other metallic substances may remain imbedded in the surface, and be adapted for conveying the electric current to the surface of the mould.

Improvements in the manufacture of safety-paper for bankers' cheques, bills of exchange, and other like purposes. WILLIAM STONES, of Queenhithe, Stationer. Patent dated February 24, 1851.

The objection of this invention is to produce a paper which shall by the discoloration of its surface indicate when an attempt has been made to obliterate or remove writings therefrom. For this purpose the patentee employs bromine, or iodine combined with ferrocyanide or ferricyanide of potassium and starch. Any combinations of bromine or iodine, with bases of various descriptions, may be used, but the patentee prefers iodide of potassium, both on account of its being more easily obtainable in the market than compounds of bromine, and because the color of the paper is in no degree affected

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by its use. This substance is mixed with the pulp or with the size, or the finished paper may be prepared by being saturated with a solution of it; the ferrocyanide or ferricyanide of potassium is mixed with the size, or may like the metallic iodide be applied at a subsequent stage of the manufacture, and the starch is added to the pulp in the engine.

The quantities required for the preparation or manufacture of safety paper may be varied, but the following proportions are stated to be suitable for the treatment of one ream of post, weighing about 18 lbs.; 1 oz. iodine of potassium, one-quarter ounce ferrocyanide or ferricyanide of potassium, and one pound of starch.

The effect of chlorine, or of a mineral acid, when employed to obliterate or remove writings from this prepared paper, is to break up one of the salts, when the iodine will be liberated, and the iodide of starch formed, which is insoluble, and of a dark color: or, if vegetable or mineral acids are employed, the small quantity of iron contained in ink would be effected by them, and the solution would combine with the ferrocyaoide of potassium, and give rise to a compound of the nature of Prussian blue, by which all the parts of the paper adjacent to that operated on would be deeply and indelibly tinged, and the fraud attempted to be practiced thus made apparent.

Claim.—The application or use of iodine or bromine, in their combined state, in combination with ferrocyanide, or ferricyanide of potassium and starch, for the purpose above set forth.

Improvements in the manufacture of gas, in gas-burners, and in apparatus for heating by gas. HENRY DRICKS, of Moorgate Street, engineer. Patent dated Feb. 24, 1851.

This invention consists:—firstly, of improvements in the method of charging gas retorts, of diminishing the quantity of coal tar produced in the manufacture of gas, and in obtaining gas from the residual coal tar resulting from the destructive distillation of coal when manufacturing gas for illuminating purposes; secondly of improvements in the construction of burners, whereby a film of gas of greater or less thickness may be obtained at pleasure; and thirdly, of improvements in heating stoves, ovens, and furnaces, by burning gas intermixed with atmospheric air.

1. According to the ordinary process of manufacture, the gas, on issuing from the retorts, is conducted to the hydraulic main, and thence by a suitable pipe to the condenser. Now it is at this last pipe that the patentee proposes to intercept its progress, and cause it to pass through a boiler containing coal tar in the proportion of ten to fourteen gallons for every ton of coal undergoing distillation, the vapor from which rises and becomes mixed with the crude gas, which then, in this combined state, passes through retorts heated by a suitable furnace, and containing boghead cannel coal, coke, and other suitable substances, by which the gas tar vapor is decomposed, whilst the gas is finally conducted to the condenser for purification. The patentee also subjects the gas, when combined with tar vapor, to the action of heat, by passing it over incandescent surfaces of suitable material. The quantity of tar produced may be diminished, by introducing into the retorts with the coal employed for charging them, coke, lime, saudust, peat, turf, or other substance capable of absorbing tar. When manufacturing gas from tar, oil, resin, or fatty matters, the patentee causes them to be projected in drops on the surface of heated boghead cannel-coal coke, instead of the ordinary coke or tiles employed for this purpose.

For charging the retorts, the patentee makes use of shoots with double bottoms and ends, capable of holding half or the whole of a charge, into which the necessary quantity of coal is placed, the shoot is then raised by means of a travelling crane running on a suspended railway in front of the range of retorts, and the end of it introduced into the retort; and when it has been forced in to its greatest extent, the shoot is withdrawn, and the charge left in the retort, being prevented from being drawn out with the shoot by the end piece.

2. The burners described are constructed of various forms, but in all, the same principle is preserved, viz., that the size of the aperature through which the gas passes for ignition may be increased or diminished at pleasure. The burners are constructed either of two flat plates of metal, for which purpose platina is preferred, or one concave and another convex plate are employed, the gas issuing forth between them. Sometimes the gas is heated before issuing from the burner, and this is effected by the flame from the burner acting on the interior of tabular casing with double sides placed above it.

3. When using gas for the purpose of heating stoves, the interior of the stove is provided with a flue of earthenware, and a pipe within it, the end of which is either closed with wire gauze, or perforated with numerous aperatures. The burner consists of a tube of smaller diameter than that first named perferated at its end, and placed con-

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centrically with it, an annular space being left all round for the admission of air to mix with the gas and support combustion. For heating furnaces, ovens, &c., the burner is of a similar construction.

Claims.—Intercepting the progress of the coal gas in its passage from the hydraulic main to the condenser, and causing it to mingle with the vapor of coal tar, and, when so combined, to pass over through or among incandescent matters in suitable closed apparatus.

2. The method of passing the crude coal gas through heated apparatus on its passage from the retort to the hydraulic main.

3. The employment in the same retort along with or adjoining the coal of the means described of diminishing the produce of coal tar.

4. The employment of the light coke of boghead cannel coal when used along with coal, or when heated alone in close vessels for the production of gas from coal tar, resin oil, or fatty matters.

5. The method of charging retorts.

6. The peculiar construction of burners described.

7. The methods described of burning gas *en masse* for the purposes of heating.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

ON A COMPARATIVE EXAMINATION OF SEVERAL KINDS OF SCAMMONY, THEIR PURGATIVE VALUE AND THE NECESSITY OF EMPLOYING THEM IN THERAPEUTICS ONLY IN THE FORM OF RESIN.

BY M. THOREL, PHARMACEUTIST AT AVALLON.

SCAMMONY would probably be the surest purgative as it already is one of the most agreeable, were its composition always identical, and above all if there were not several species in commerce all differing one from another in their physical properties, from the choicest scammony of Aleppo to the scammony in cakes, or, of Montpellier.

If this last sort is easily distinguished at the first glance, it is not the same with another which contains even less of the purgative resin, and the low price of which is very attractive.

It is beyond a donbt that the uncertainty of action of which scammony is accused comes of our using it as delivered to us in trade, more or less pure according to the kind from which it comes and the manner in which it is gathered. It will then be seen that it is impossible to appreciate its purgative value at the first glance, and for this reason the physician not knowing the exact quantity to give, abandons it in consequence of the deceptions to which he finds himself subject. MM. Merat & Delens in their *Dictionnare de matière médicale*, say "Scammony is often reproached with being an uncertain purgative, which is sometimes true, and appears to depend upon the commercial description used; but it more often depends upon the state of the subject to whom it is administered." When we find that its composition varies from 6 to 80 per cent. or more of active substance, as I shall soon prove, we may be permitted to consider that the first part of the judgment of MM. Mérat and Delens is more correct than the second.

The worst sorts being easily taken for the best, as no external characteristic is a criterion, not even the surest, the odor of briosh or melted butter, the result will certainly be the abandonment of this medicine, in many cases a very valuable one and therapeutics would thereby sustain a great loss. To avoid this it will be better to use it only as extract or resin; in this manner all sorts are brought to the same point by losing more or less of their inert matter, according to their impurity. These resins will be all alike from whatever kind they proceed, and the practitioner once certain what doses to give will obtain the best results.

It appears that formerly the scammony from Smyrna was the most esteemed; its composition must therefore be quite changed or was not its high estimation due to ignorance of its composition? This latter cause is the most probable, for it is scarcely possible that this scammony, containing in reality but one third of the resin that Aleppo, should be changed on this point.

These two sorts are well known, and according to the writers on *materia medica*, they may be recognised when carefuliy examined that of Aleppo appears less earthy, and when rubbed it has a strong odor of briosh which is only possessed in a very slight degree by the other. This character whih is regarded as the best criterion may lead to a false judgement as to their quality. The following fact sufficiently proves the

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error into which we may fall by depending on these signs. One scammony, which I would not use because it had no odor gave me 84 per cent of resin.

The scammony in cakes, which is little used, and which should never have been admitted into commerce, is a product fabricated at Montpellier with various substances; it is hard, black, heavy, compact, whitens the saliva but little if at all, and, notwithstanding its bad quality, it has a sensible odor of briosh or of melted butter. I do not think that it is made, as M. Guibourt says, with *Cynanchum Monspeliacum*; the residue, when treated with alcohol and dried is too heavy and too hard for it to have come from this plant. This residue has all the character of ammoniacal and nitrogenous compounds. Besides, a traveller in the environs of Montpellier, to whom I have spoken, assured me that the *Cynanchum* was a complete stranger there, and that its fabrication was even unknown in the country.

A fourth sort was sold to me last summer by a commission house in Paris, under the name of *Scammony of Aleppo.* I ought to state, that I was not deceived, but suspected it at the first glance. This kind, which may be designated by the name of *gum scammony*, because it is composed almost entirely of gummy matters, is in irregular pieces, resembles the good qualities a little; it is hard and horny, difficult to pulverise, greyish in color, with a sweetish taste, insipid at first, and afterwards slightly affecting the throat. Completely inodorous, dry, it gives a slight odor when rubbed and moistened with saliva, which it whitens a little. It only contains 6 per cent. of a greenish and not very purgative resin. The residue of the alcoholic treatment, put in contact with boiling distilled water, swells up very much, and is difficult to dissolve; by precipitating by alcohol at 40° the gum dissolved in water, and evaporating the liquid from which the gum has been eliminated, I obtained only an almost inappreciable residue. This sort, improperly called *scammony*, has nothing of it but the name, and is composed of 92 per cent. of gum, which is only soluble in a large quantity of water, analogous to the gum of the cherry tree; it appears to have been made in Europe.

The chemists who have made analyses of the scammonies of Aleppo and Smyrna, the others not having been yet examined, differ as to the quantity of resin which they contain. MM. Bouillon-Lagrange and Vogel have found 60 per cent. in the first, and 29 per cent. in the second; whereas M. Guibourt mentions 75 in that of Aleppo, the only one which he has analysed, and M. Soubeiran still more, 80 per cent. The fidelity of these works is undoubted; this variety of results can therefore be produced only by the difference of the composition of the scammony on which these learned men have operated.

Eight samples of Aleppo scammony, from the best druggists of Paris and Lyon, furnished me with quantities of resin varying from 45 to 84 per cent. With that of Smyrna I obtained only from 18 to 20 per cent. Between my analyses and those of M. Bouillon-Lagrange, which date far back, there is likewise a great difference; these latter then have lost in quality, whereas the others have gained. These variations in their past, present, and probably future composition, sufficiently demonstrate the necessity of bringing all to a level, by means of the elimination of the totally inactive substances which they contain.

Their commercial value should be relative, and based upon the quantity of resin which they contain. For this purpose it would be indispensable to assay them in the same manner as is done with quinquinas; it would suffice to treat a small quantity with boiling alcohol, for instance, 5 grammes, filter and evaporate the alcohol in a small porcelain capsule. Taking as an average the figure of 75 per cent. for Aleppo scammony and 20 per cent. for the other, we could not be deceived.

This assaying becomes indispensable in dealing with a product the composition of which is so variable. Neither external appearance, nor the odor of briosh or melted butter suffice in judging of it and appreciating its quality. If we depend on the form or the aspect presented by the different species of scammony, we should be often mistaken, for fraud has so many resources that it can imitate everything. As for the odor, this is the more likely to induce error, as it is as yet regarded as infallible. As for this indication, a sample which I had thrown aside because it had absolutely no odor, gave me, as I said just now, 84 per cent. of resin: this is the largest proportion I have obtained.

One other fact will prove still more forcibly, if possible, the little confidence which should be accorded to raw scammony. In 250 grammes of Aleppo scammony, bought at Lyon in one of the first drug houses, I found three qualities; one portion gave me 84 per cent. of resin: this was the one which being without odor I judged to be bad; another 68, and the third only 49 per cent. This with the latter, supposing

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that the physician had prescribed a gramme, the patient would have taken only 49 centigrammes of purgative substance, whilst with the first he would have taken 84 centigrames, a difference almost of half. These causes being unknown, the variation in the result is attributed to the more or less robust, more or less susceptible constitution of the individual.

All scammony does not contain gum; there is none in the best; for alcohol at 40 degrees produces in the residue, treated with boiling water, no precipitate. One other peculiarity is, that whenever there is gum, there is sure to be amylaceous fecula; I never found one sample in which they were not together; tincture of iodine always colored liquors more or less blue.

This property of tincture of iodine furnished me with an excellent reagent for classing the scammonies. Whenever iodine gives no blue caloration we may be sure that we have a good quality in our hands: as an exeception, one single sample upon which tincture of iodine was without action gave me but 68 per cent of resin. The intensity of the blue color will be greater as the quality is worse; thus the deeper the coior the less resin is contained. In general, a large quantity of gum and of fecula denote a bad scammony. When we do not wish to have recourse to the extraction of the resin as a test and we merely wish to know if it is good, this method may be employed with certainty. Put 0·50 to 0·60 gr. in 20 or 30 grammes of boiling distilled water; agitate it for an instant, decant and letfall into the liquid one drop of tincture of iodine. The scammonies of Smyrna and Montpellier give a very dark color; it is only the bad quality of the Aleppo scammony, that which gives the least resin, which becomes blue with iodine.

The following are the products which I obtained from the scammonies which I analysed.

	Aleppo No. 1.	Aleppo No. 2.	Aleppo No. 3.	Aleppo No. 4.	Smyrna.	Montpellier or cake.	Gum Scammony.
Resin	84	75	62	45	20	9	6
Gum and amylaceous fecula....		1	4	3	5	3	90
Extractive matter soluble in water	3	4	6	6	7	8	1
Earthy matter insoluble in water	13	20	28	46	68	80	3
	100	100	100	100	100	100	100

The alcoholic extract indicated in the analyses appeared to me to be placed best among the substances soluble in water, because it dissolves in it completely when separated from the resin.

PREPARATION OF THE RESIN OF SCAMMONY.

The degree of the alcohol is not without importance in the preparation of the resin of scammony. The following table shows this by giving, with the degree of the alcohol, the corresponding product.

Scammony 10 gr.	Alcohol 120 gr.	24 hours of maceration.	At the temperature of 68° F.
Scammony of Aleppo, No. 2 of the analysis.....	Alcohol at 32° Resin 6·50 gr.	Alcohol at 26° Resin 7·50 gr.	Alcohol at 22° Resin 7·00 gr.
Scammony of Smyrna	,, 2·20 ,,	,, 2·00 ,,	,, 3·20 ,,
Scammony of Montpellier..	,, 0·80 ,,	,, 0·80 ,,	,, 1·20 ,,
Gum Scammony		,, 0·60 ,,	,, 1·70 ,,

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By examining this table, we perceive first that with weak alcohol more resin is obtained from the inferior sort than with strong alcohol, then that alcohol at 26 degrees gives more resin from good qualities than alcohol at 32 degrees. Therefore whatever be the scammony used, the resin should always be prepared with alcohol at 26 degrees.

Alcohol at 32 degrees does not dissolve out all the resin from the Aleppo scammony; of this I assured myself by treating the residue with alcohol at 26 degrees; it removed a considerable quantity,—quite as great as the first. On the other hand, this alcohol at 32 degrees removes from the bad sorts quite as much extractive substances.

The alcohol at 22 degrees, on the contrary, dissolves the gum and inert matters which must be separated afterwards to avoid having an inactive resin, and it is chiefly in the less rich scammonies that we have to fear this. But the strongest reason against using this alcohol is that in the best qualities it leaves untouched much of the purgative substance which it is unable to dissolve.

It is evident, from this table, that the scammony which was sold to me under the name of Aleppo, and which I have called *gum scammony*, as well as the Montpellier scammony, should never be used, either in the natural state, nor even for the extraction of the resin, whatever be their price, because they furnish an impure and but slightly purgative resin, notwithstanding the small quantity that they give.

That the scammony from Smyrna can be employed only for the extraction of resin; but for that purpose it would be necessary to reduce its price at least one half, and the resin obtained is never very white, when bleached with charcoal.

That the good Aleppo scammony should always be preferred, although the price is rather high, because it gives a fine product merely by the evaporation of the alcohol and without other precautions.

RESIN OF SCAMMONY.

	gr.
Aleppo scammony.....	2 0
Alcohol at 32° (3 6 of commerce)	2000
Water.....	400

I place the whole in a closed sand bath, which I leave for two days at a temperature of 68° F, taking the precaution of shaking it from time to time. I filter, and put a little more alcohol upon the residue to remove any which may remain; I then distil in the sand bath to recover the greatest portion of the alcohol. I then cause the residue to evaporate in a porcelain capsule at a very gentle heat, until all the moisture is removed.

With the best kinds the operation is thus terminated. If, on the contrary, the resin is to be extracted from Smyrna scammony, or even from Aleppo scammony of bad quality, it is necessary, at the close of the operation, when there is but little liquid left in the capsule, to add tepid water which removes the coloring matter; it is decanted, and the dessication finished. The employment of charcoal did not succeed as I expected; some of the resin and much alcohol are lost without obtaining a finer product.

The *Codex* gives no formula for the preparation of this resin; that is, it refers to the preparation of resin of Jalap. There is, nevertheless, a great difference between the composition of this root and that of scammony. Jalap contains a great quantity of extractive substances soluble in alcohol and in water, and which must be removed by an aqueous treatment; whereas, when employing the best scammony, there are none or very few, and consequently the addition of water becomes useless.

MODE OF ADMINISTRATION.

The resin of scammony is the easiest purgative to take. Children swallow it in milk without perceiving it. One formula, given by M. Planche, will suffice; the resin becomes a perfect emulsion with the milk, neither changing its color nor its taste.

The doses indicated in the formularies appear to me too weak; I think they should be increased in the following order; for children from 2 to 4 years, 30 centigrammes; from 5 to 8 years, 50 centigrammes; from 10 to 15 years, 75 centigrammes; and for adults from 1 gramme to 1½.

The result of these researches authorises me in concluding:

1st. That scammony, whatever be its origin or quality, should be used in therapeutics only in the state of resin;

2nd. That the scammony in cakes and gum scammony should be, not only abandoned, but withdrawn from the *materia medica*, as sophisticated medicaments, and seized wherever they may be found;

3rd. That Smyrna scammony does not possess the purgative action in as high a degree as has been hitherto supposed; that, notwithstanding this, it may be used for extracting the resin, although the product is always rather colored in spite of all precautions; but for this purpose the present price must be reduced by half;

4th. That Aleppo scammony, notwithstanding its high price, should always have the preference;

5th. That tincture of iodine furnishes a sure reagent to distinguish good scammony

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from bad; that it is more certain than all the characteristics hitherto known;

6th. That nevertheless, if we wish to know exactly the richness of a sample of scammony, the only method is to treat a small quantity of it with alcohol;

7th. Finally, that alcohol at 26 degrees is the only suitable strength for the extraction of the resin from all kinds of scammony.—*Journal de Pharmacie et de Chimie*, August, 1851.

OBSERVATIONS ON SCAMMONY.

BY M. GUIBOURT.

If there be a truth which well deserves repetition it is that an exact acquaintance with medicinal drugs, and great practical experience in the preparation of medicaments, are indispensable to a pharmaceutist as the most honorable foundation of fortune and reputation. A pharmaceutist who cannot distinguish a good medicinal substance from an inferior or adulterated one; who purchases all his medicaments, extracts, syrups, plasters, distilled waters, and chemical preparations, merits the confidence neither of the public nor of physicians, and cannot complain if his shop is abandoned.

Another thing to be carefully avoided by pharmaceutists is discrediting simple medicaments, by imagining that it is very difficult to have them of good quality, or that they are so variable in their composition that physicians can place but little dependence on their effects; for there is but one step from the discredit of the medicinal drug to that of its preparations, and have many medicaments already fallen into oblivion, from which medicine might, nevertheless, derive great advantage.

These reflections have been suggested to me by two notes relative to scammony, recently published by M. Thorel, pharmaceutist at Avallon, and by our colleague, M. Dublanc,* and must be my excuse for the critical examination which I am about to make of their two publications. Both, indeed, relying on the fact, which is in my opinion, disputable, that Aleppo scammony may vary in its nature to such a degree as to offer from 17 to 96 per cent. of purgative resin, without our being able to perceive it in its physical characters, conclude that scammony in its natural state should be banished from use in medicine, and replaced, in all cases, by the resin obtained from it by means of alcohol. I consider myself in a position to say, on the contrary, that good Aleppo scammony possesses sufficiently certain physical characteristics to distinguish it from the inferior or adulterated kinds, and that its direct application on the manufacture of medicines may be continued. I will even add that it is much easier to distinguish a good scammony from a bad one, than it would be to discern a pure resin of scammony from one which is mixed; insomuch, that in the deplorable state into which, according to several opinions, the preparation of drugs has fallen, a pharmaceutist who bought his resin of scammony in the trade, would be much more likely to be deceived than if he bought the scammony itself.

According to M. Thorel, in the first place, "it is beyond doubt that the infidelity for which scammony has been reproached, proceeds only from using it as presented to us in the trade, without the possibility of ascertaining its purgative value at the first glance; and as the bad sorts may be mistaken for the best, as no external characteristic gives certainty, not even the odor of briosh, which is considered the best, the certain result will be the abandonment of this valuable medicament, if not employed in the state of extract or resin. In this manner all would be reduced to the same standard; *the resins would be the same from whatever source they were derived*, and the physician, once certain what doses to prescribe, would obtain the best results."

I must be permitted to say that I do not agree with the whole of this conclusion. For if it would often be advantageous to substitute, for the primary matter, the principle, or the portion which is the cause of its principal property, it is on condition that this primary matter should, in first place, be chosen of good quality; it would not be thought sufficient, for example, to extract the resin from scammonies of any quality or origin, and that would not be considered the best which have the most resin, merely because it contained the most. It is evident that nothing would be easier than to adulterate scammony with a common resin.

In the present case, what I blame M. Thorel for, and even M. Dublanc a little, is resting on insufficient characters, or of being contented with this reason, which is not less so, that the scammonies examined by them had been purchased in the best drug houses of Lyons or Paris. Now as there is not a single drug house, however good it may be, that has only goods of the best quality, it is the duty of the pharma-

* See preceding article, and The Chemist, New Series. Vol. 2. (1850—51.) p. 326.

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ceutist to choose among those which he finds there, the substance which presents the marks of the best species.

Besides, M. Thorel gives the name of Smyrna scammony to the inferior sorts, more or less adulterated, of the Aleppo scammony; whereas it constitutes a distinct species, which may be found as pure and as resinous as the other, but which, perhaps, does not contain the same amount of purgative property. As for the *scammony Montpellier*, M. Thorel quotes me only to blame me for saying that this scammony was made of the juice of the *cynanchum monspeliacum*, and he adds that a traveller from the environs of Montpellier told him that this *cynanchum* was quite a stranger to the country, and that the fabrication of scammony was unknown there. I own that I have myself seen neither the plant nor the manufacture; but I hold the facts as true, because of the authorities on which they rest. These are, in the first place, Lobel and Pena, the latter a native of Narbonne, who, under the name of *scammonium monspeliense*, describes and figures the plant which Linnæus afterwards called *cynanchum monspeliacum*, and who tells us that the plant is very abundant along the whole sandy beach of the Mediterranean, from the mouth of the Rhone, as far as Agde; that the milky juice of which it is full is employed as a purgative; but in larger quantities than the scammony from Syria; finally, that this juice, when dried without addition, is of a black or brown color. (*Adversaria*, p. 273.)

Clusius afterwards found it on the coasts of Valencia and Languedoc, principally on the part between the sea and the lake of Thau, a creeping plant of the genus apocynum, completely full of a milky juice, and which is also the *cynanchum monspeliacum* Linn. (*Rariorum*, p. 125.)

Jean Bauhin again adds to the preceding details, that with the juice of this plant and rosin, the inhabitants of Marseilles adulterate scammony with so much skill, that it is difficult to detect it. (*Hist. Plant.*, t. XI., p. 136.

I might also quote Magnol and Gouan, both physicians in Montpellier, and celebrated botanists; but the preceding will suffice to show that the *cynanchum monspeliacum* is very abundant on the coasts of the Mediterranean, and that its milky juice serves to prepare a sort of scammony which can only be that known under the name of *Montpellier scammony*. I have already mentioned that different resins were added to this juice that its physical characters and its nature were very variable, and that it should be decidedly rejected by the pharmaceutist.

I have blamed M. Thorel with having been satisfied with insufficient characters in the choice he made of his scammonies; the following appears to me a proof of this: a scammony which he had, but which he would not use, *because it had no odor*, nevertheless gave him 84 per cent of resin. He immediately draws from that circumstance the conclusion that the character drawn from the odor is faulty, and he places this inodorous scammony at the head of all the others.

Notwithstanding this, the odor of briosh which is exhaled by scammony when united in masses, or rubbed or warmed by the breath, is, I do not say the sole, but one of the best indications of its good quality, and it is probable that that very resinous and inodorous scammony of M. Thorel was not pure; in which case the resin obtained would not be either; what advantage then would result from its preparation?

It is therefore necessary to ascertain the purity of the primary matter, *by the combination of all the characteristics of which it ought to be possessed:* when thus chosen, it will probably be found to constitute a sufficiently uniform medicament and sufficiently constant in its effects for to remain among those which the physician and pharmaceutist can employ.

I admit, however, that it would often be advantageous to employ the resin of scammony in the state of purity. Why, then, does not M. Thorel give us a better method of obtaining it in this state? Thus, he blames the *Codex* for referring for the preparation of the resin of scammony to that of the resin of jalap, which, says he, containing many extractive matters soluble in alcohol and in water, renders it necessary to extract these matters with water; whereas, by employing the better scammonies, which contain very little of them, the addition of water is rendered unnecessary.

Notwithstanding this, M. Thorel said at first that the bad qualities might be taken for the best; therefore as these bad qualities contain more extractive matter, it will remain mixed with the resin.

Subsequently, M. Thorel does not advise treating scammony by alcohol at 36° Cart., which would give almost pure resin; nor even by alcohol at 32°; he recommends taking alcohol at 26°, because he found that this alcohol gave a larger product than the other. That is to say, that this alcohol dissolves the extractive or gummy portions, which render the extract more impure, and

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it is the direct product of evaporation that he prefers to the resin of scammony of the Codex!

As for M. Dublanc, he follows the process of the Codex for the preparation of the resin of scammony; therefore, I have no fault to find with him except that of being too absolute in his proposition of substituting, in all cases, resin of scammony for scammony in a state of nature; either because *the finest scammonies of commerce may present very various characteristics*, or because *the most beautiful scammony with the most favorable external characters* may contain only 17 parts of resin, whereas others, similar in appearance, furnish 20, 22, 27, 28, 36, 50, 64, and 96 per cent of resin. If these figures are exact it is certain that scammony would be the most faithless of medicaments, but are they quite certain? And to begin with, if scammonies *considered the most beautiful in the trade*, presented very dissimilar characters, is it not because, in reality, they were of different qualities? On the other hand, were the scammonies which differed so much as to come 17, some 96, per cent of resin, so well provided with the same physical characters that there was no method of distinguishing them? I must be permitted to doubt this.

I have still some observations to make on the letter of M. Dublanc. He was not the first to mention the small quantity of gum contained in scammony, and the frequent presence of starch in the commercial product. Besides, he overrates the bearing of these two facts, by stating as a principle, that the gum is not a part of the elements of scammony, and that *it consists, independently of the resin, of fecula*. Fecula, although contained in abundance in the root, does not form a part of the milky juice which constitutes scammony, and does not become mixed with it except when, instead of confining themselves to extracting the milky juice by incisions, they pound the roots, and express the juice, to dry it afterwards in the sun or over the fire. Indeed, it is certain that the fine kinds of scammony from Aleppo contain only a very small quantity of starch, and that quite accidentally; and that it is the most inferior kinds, obtained by expression and rejected by the pharmaceutist, that contain 15, 17, and even 36 per cent. It is likewise certain that what constitutes the scammony in the plant, in the state of milky juice, and which gives it the property of reconstituting a milky and viscid juice with water or saliva cannot be starch; but the extractive and gummy parts which it contains, which form an essential part of it, and which, notwithstanding their small quantity, suffice as a reason for the place given to scammony among the products designated under the general name of *gum resins*.

I conclude by presenting to the *Société* a salt which I obtained a long time ago, in analysing the scammony of Aleppo, and which I have never had time to examine or produce again. I had remarked, contrary to the observation of Bouillon-Lagrange, and of M. Vogel, that the product of the washing with water of resin of scammony, powerfully reddened litmus paper. It was by saturating the liquor by ammonia and concentrating it by evaporation, that I obtained this salt, the ulterior examination of which cannot fail to be very interesting.—*Journal de Pharmacie et de Chimie, Aug.*, 1851.

HISTORICAL NOTES RESPECTING BERNARD COURTOIS, AND ON THE DISCOVERY OF IODINE.

BY M. CAP.

THE interest which attaches to the origin of great discoveries is not without analogy to that which leads us to seek out the first moments of the existence of celebrated men. After the history of nations and of eminent persons, there is, in fact, nothing so curious as that of objects of utility. We like to trace a great discovery to its source and through its divers phases, from the moment when chance or observation first brought it to light, to its latest development. The history of the sciences should have its golden book, for nations, as well as individuals, have an interest in knowing the origin and dates of all that relates to the annals of civilisation.

It is now nearly forty years since iodine was discovered, and, from that period the study of this interesting body has never ceased being the object of research to the most distinguished chemists. It seems as though every day had developed some new property, some new application of iodine to chemistry, medicine, the arts and manufactures. The study of no other substance has been pursued with more perseverance; it offers perhaps the only example of a new body, on which, after so few years, there appears to be nothing more to say; and yet scientific men pursue the subject with undiminished ardor. At the present time it still forms the subject of more than one, what may be termed, *obstinate* investigation. At first discovered only in the mother waters of the soda of sea weed, it is now found in almost all bodies in nature; quite un-

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known until 1813, it is now shewn to be, if not as abundant, at any rate as universally diffused, as the elementary bodies, which figure most generally in natural substances.

The history of all those researches is well known to all who are occupied with chemistry and the arts to which it applies. The details relative to its first discovery are less known, and still less the history of the modest man of science to whom we owe it.

Bernard Courtois was born at Dijon, in 1778. His father was preparator of the course of chemistry which Guyton-Morveau gave in that city, in which he at the same time exercised the highest functions of the magistracy. The elder Courtois was one of the first to establish an artificial nitre bed, which he carried on for many years, and which he gave up towards the close of his life to his eldest son : a circumstance which explains Bernard's predilection for this branch of industry. The latter, at the age of eighteen, was placed at Auxerre, in the pharmaceutical establishment of M. Frémy, the father of M. Frémy, of Versailles, and grandfather of our fellow-laborer, now professor of chemistry at the *Muséum*. When his apprenticeship was finished, Bernard Courtois came to Paris, where, at the recommendation of Guyton-Morveau, he entered the laboratory of Fourcroy, at the Polytechnic School.

Called to arms by the requisition of 1799, Courtois was employed for some time in the military hospitals, and on his return to Paris entered the laboratory of M. Thenard. In the following year he was one of the young chemists whom Armand Seguin placed in a laboratory which he had just opened, to work for the advancement of a science to which he owed his immense fortune.

In the division of the works which Seguin wished to undertake, Courtois was intended to study opium. He devoted himself to these researches and succeeded in isolating from opium a crystalline body, with alkaline reactions, and susceptible of combination with the bases. However, as he obtained this substance by the intervention of ammonia, he could not affirm that it did not thence derive its alkaline properties. More bold than he, Sertuerner gave the name of vegetable alkali to the crystalline substance which Courtois had discovered, which was nothing less than morphine, and he had the honor of opening a new path for science, and revealing the existence of a series of bodies, now designated by by the name of *alkaloids*.

The work of Courtois gave rise to a memoir on opium which Seguin read before the Institute, on the 24th of December, 1804, and which was only inserted ten years after in the *Annales de Chimie* (t. LXXXIX. p. 225). The alkaloïd of opium was so clearly described in it, that Vauquelin did not hesitate to give Seguin the priority in the discovery of morphine, when Sertuerner published his work (1816). But this was in reality the fruit of the skilful researches of Courtois. The latter quitted Seguin's laboratory in 1804, to establish an artificial nitre bed, founded on some new processes of his own, and which he developed very extensively. It was there that while preparing nitrate of soda in a large way, which he obtained by decomposing nitrate of lime with the soda of seaweed, he remarked that the coppers were very quickly destroyed. He studied the causes of this destruction of the metal, and found that the copper combined with a substance of the nature of which he was ignorant. To isolate this substance, he proceeded to treat the mother waters of the sodas, and concluded by removing the new body in a state of great purity. This discovery took place in the course of the year 1812.

Towards the end of 1813, he sent several samples of the new body to his old colleagues. Being much occupied with his industrial pursuits, he found himself forced to suspend the researches which he had already undertaken on this subject. Nevertheless, it was in his name that on the 29th November, 1813,* M. Clément Desormes announced his discovery to the Institute. In the following sitting, the 6th December, M. Gay-Lussac read a note in which he established the connection of the new body with chlorine, and gave it the name of iodine, because of the violet colour of its vapor †

One of the samples which Courtois distributed had fallen into the hands of Sir Humphrey Davy, who happened accidentally to be in France. Struck with the singular properties of this body, the English chemist made a rapid examination of it, and in a letter which he addressed to Cuvier, and which the latter read to the Institute on the 13th December, he examined its combinations with potassium, sodium, the metals, and some gases.‡ Finally, on the 27th December, of the same year, M. Colin, then a teacher in the Polytechnic School, likewise read to the In-

* *Annales de Chimie*, t. LXXXVIII. p. 304.

† Ibid, p. 322.

‡ Ibid, p. 322.

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stitute a note on some new combinations of iodine; being experiments made under the eye and under the direction of M. Gay-Lussac.*

The haste with which Davy published his first results, immediately after the first communications having been made to the Institute, and the insinuations of the English journals which tended to report the priority of their countryman, annoyed M. Gay-Lussac to such a degree that he thought it right to assert the facts in his great memoir on iodine, published on the 1st August of the following year. He gives the history of the discovery of Courtois in the following manner.

"Two years had already elapsed since M. Courtois had discovered iodine, when M. Clément announced it to the Institute, on the 29th November, 1813. M. Courtois had observed many of its properties, particularly that of forming a very fulminating powder, when treated with ammonia. He proposed to study all its characters, but being withdrawn from the labors of the laboratory, by the care necessary for a very active manufacture of saltpetre and many other products, he engaged M. Clément to continue his researches, M. Clément, for similar reasons, could only devote a short time to it. Nevertheless, he discovered among other results, that by putting iodine in contact with phosphorus, a gaseous acid was obtained, bnt he concluded from his experiments that this gas was composed of one fourth hydrochloric acid and three fourths of iodine.

"M. Clément was still occupied with his researches when Davy came to Paris, and he thought he could not better welcome so distinguished a man of science, than by shewing the new substance, which he had hitherto shewn only to M M. Chaptal and Ampère. I speak of these circumstances as a reply to the strange assertion made in the journal of Messrs. Nicholson and Tilloch, No. 189, p. 69. It appears that this gas (iodine) was discovered above two years ago; but such is the deplorable state of scientific men in France, that no account was published till the arrival of our English philosopher there. It is Davy who is spoken of. A short time after having shewn iodine to Davy, and communicated to him the result of his researches, M. Clément read his note to the Institute and concluded it by announcing that I was going to continue them. On the 6th December I read a note to the Institute which was printed in the *Annales de Chimie*.* No one, until now, has denied that I was the first to make known the nature of iodine, and it is certain that Davy did not publish his results until more than a week after he knew of mine."

The attention of chemists in all parts was fixed on this singular body. On the 20th December, 1813, Gay-Lussac read a new memoir on its combinations with oxygen.† In the following March, MM. Colin and Gautlier de Claubry presented their researches on the reciprocal action of iodine and organic substances.‡ On the 4th June, Vauquelin published his experiments, in which he studied the combinations of iodine with ammonia, tin, mercury, and alcohol.§ Finally, on the 1st August of the same year, appeared the great memoir of Gay-Lussac, in which that chemist established the general properties of iodine, its combinations with the simple bodies, with hydrogen, the oxides, and chlorine: in which he examines the alkaline and metallic hydriodates, the iodates, and hydriodic ether. This fine work is perhapsthe most complete ever produced by science. It is in this memoir, which consists of no less than a hundred and sixty pages, that Gay-Lussac for the first time designated by the name of *hydracids*, the compounds of this nature formed by hydrogen. At the same time he was already occupied by another work which added still more to the renown of its author,—the memoir on cyanogen; for when speaking of the hydracids, of which he formed a distinct group in opposition to the oxygenous acids, he wrote the following phrase: "Prussic acid should undoubtedly be placed in a separate group, although near to the hydracids, but it would be premature to determine its classification before knowing its nature exactly."

The general properties of iodine were established, as well as the bases of its combinations; but the researches were not therefore discontinued. Some extended its relations with other bodies; some chemists applied themselves to the simplification of its extraction, others to proving its presence in natural productions. The methods of analysis were brought to such perfection, that the existance of iodine can be proved in solutions where it is found only in infinitessimal proportions. Besides the mother liquors of soda, in which it exists in very large quantities, it is discovered in mines, in combination with metals, in rocks, combined with earths and alkalies; in coal,

* *Annales de Chimie*, t. XCI, p. 252.

* *Annales de Chimie*, t. LXXXVIII, p. 311.
† Ibid, p. 319. ‡ Ibid. § Ibid.

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in marine productions, in mineral springs, in fresh water, in aquatic plants; finally, in the tissues of living animals, in fossil fucaceæ, in aërolithes, and even in the air we breathe.

Among the happiest applications of iodine may be mentioned, first, its numerous chemical reactions: iodide of starch among others,* one of the most delicate reagents that we possess, and which has given rise to the invention of the *sulphohydrometer* of Dupasquier.† The application of iodine to medicine, which is due to Dr. Coindet, of Geneva, has rendered great assistance in the treatment of lymphatic diseases ‡ Finally, an entirely new art may be attributed to the discovery of iodine; namely, *photography*, the object of which is to create, merely by the action of light on an iodised plate, drawings in which objects preserve their forms with mathematical precision, in all their smallest details, as well as the gradations of the tints and the effects of perspective.

But while the discovery of Courtois was being developed in so brilliant a manner, its author had to struggle with bad fortune. In 1815, when our ports were opened for foreign products, great quantities of saltpetre from India arrived in France, and at one blow, destroyed the artificial nitre beds. Courtois, whose whole pecuniary resources had been invested in this manufacture, saw annihilated, not only all his manufactured products, but likewise a considerable amount of material: his ruin was rapid and complete. He tried to extricate himself from his troubles by the manufacture of iodine, but the consumption of this substance was at that time but small, and was far from producing large profits. Courtois endured with resignation the attacks of age, infirmity, and grief, when, in 1831, at the generous proposition of M. Thénard, the Academy of Sciences decreed a prize of 6000 francs (about £240) to the author of the discovery of iodine: a recompense which he had neither asked nor even wished for, and which was all the dearer to him because he owed it to the intervention of an old friend.

To the end of his life Courtois employed himself in chemical researches. Opium, which he often took during his sufferings, was peculiarly the object of his investigations. It is probable that he had a glimpse of codeïn, for he announced as certain that morphine was not the only alkaloïd contained in opium.

Courtois died in 1838, without issue, and leaving to his widow nothing but a justly celebrated name. But we must not suppose that science was ungrateful to the author of so great a discovery. Voluntary subscriptions, assistance obtained from the government, came in aid of the unfortunate lady, and quite recently, the *Société d'encouragement* has rendered comfortable the existence of the sole inheritress of this name, as dear to science as to arts and manufactures.—*Journal de Pharmacie et de Chimie, August*, 1851.

* *Annales de Chimie*, t. XC.

† *Annales de Chimie et de Phys.* and *Journ. de pharm.* 1840.

‡ *Soc. helvet. dee Sc. natur., July*, 1820. —*Bibliotheca Britannica*, v. XIV. & XVI.

THE SCHOOL OF PHARMACY AND THE PHARMACY BILL.

FROM the subjoined extract from the Pharmaceutical Journal for September, it would appear that the School of Pharmacy is likely soon to be numbered amongst the things that have been. The embryo Chemist will in future be obliged to seek instruction at his own expence, unaided by the contribution of large sums annually from the funds of the Society, and "Professor" Redwood will, we presume, be relieved from the very arduous duties of communicating a smattering of chemistry to a few youths, whose proficiency has afterwards to be tested by examiners connected with the Society. We are very glad to find that there is a prospect of the anomaly of the same body performing the duties of instruction and examination being abolished, and still more glad that the Society will be relieved from the support of this department, more especially as its income is less adequate than formerly to sustaining the burthen. Still, we cannot but see in this the first step towards a considerable alteration in the position of the Society. In the School, divers and sundry private interests have been linked together, and it is quite impossible that it should be annihilated without alienating from the Society the regards of those connected with it. It is our opinion, at present, that the bill will not pass next session: we have strong reasons for this opinion, amongst which is a doubt whether, owing to the circumstances

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attending his election, the Legislature is favorably disposed to a measure introduced and advocated by Mr. Bell.

"In the event of the passing of the Pharmacy Bill, it will be necessary to make a new arrangement respecting the School. We have already explained that according to the recognised principles adopted by Parliament in reference to institutions of this description, the functions of educatian and examination are considered incompatible. It is held to be inexpedient to confer on an educating body the powers of examining and licensing, or granting diplomas under an Act of Parliament. When this subject was before the Council in 1846, two propositions were considered. First, the continuance of the Society as an educating body, and the establishment of a College of Pharmacy for conducting the examinations; secondly, the adoption of the Society as the examining body and the relinquishment of the School of Pharmacy.

"It was at that time thought desirable to adopt the former course, and the draft of a bill was prepared accordingly, Several difficulties, however, arose in reference to the details, some of which were rather complicated, involving, as they did, the maintenance of two institutions; and it was afterwards decided that the best course would be to simplify the measure as much as possible, and aim at an extension of the powers of the Society as an examining body. On this principle the Pharmacy Bill was framed, and if the Bill should be carried, the discontinuance of the School of Pharmacy as at present constituted, will be a necessary consequence. Education will, in that case, be left to private enterprise; and in the demand which a compulsory examination would create, there is every reason to believe that ample means of instruction would be called into existence. The Society has paved the way by the establishment of a School as an example of the kind of institution which is required for imparting to Pharmaceutical Students the requisite qualification.* In this respect the School has answered the purposes for which it was intended. That it has always been a heavy drain upon the funds of the Society has been stated from time to time in the reports of the Council. We have already observed, that on the passing of a Bill making examination compulsory, this expense would cease. In case the Bill should not pass during the ensuing session (and it is proper to be prepared for any contingency), then it will be necessary to consider what arrangements may be advisable in reference to the School, for the purpose of curtailing the heavy annual expenditure."

We have determined on reserving for the present our opinion on the measure before Parliament: at the proper time, however, we shall lay our views before the trade, and in the mean time we hope that our readers will continue to communicate to us their sentiments in reference to the Bil l, as by this means we shall be assisted in our deliberations on the subject. THE CHEMIST represents the great majority of the chemists of the United Kingdom, and is not devoted to the interests of a clique.

* This is simply ridiculous. It stands forward as an example to be avoided, for it has cost an enormous sum beyond its receipts, and has failed in all respects. Besides, it was *not* intended for any such purposes.—ED. CHEMIST.

PROVINCIAL SCHOOLS OF MEDICINE AND PHARMACY.

UNDER this head, the *Pharmaceutical Journal* for September, has the following remarks:—

"The anticipation of a compulsory examination in Pharmacy has induced many to apply themselves to study in a manner which they would not otherwise have thought necessary, and the numerous enquiries on the subject, which have resulted from the late discussion on the Pharmacy Bill, clearly prove that in the event of such a Bill becoming the law of the land, a general impetus will be given to Pharmaceutical education.

"To meet this demand it is desireable to take advantage of every opportunity which may present itself, and as the candidates for instruction are spread over the entire kingdom, whatever local facilities may exist ought to be encouraged. It is not likely that provincial Schools of Pharmacy will be found to succeed as separate establishments. In two or three localities—for example, in Liverpool, Manchester, or Birmingham—such schools might probably be kept alive by much zeal and liberality on the part of their promoters. But they can never remunerate the professors, nor is it likely they would realise a return sufficient to defray the current expenses.

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"Where a medical School exists, the establishment of a Pharmaceutical branch for the benefit of Chemists and Druggists may, in some instances, be found practicable and advantageous. A small additional outlay and a modification of some of the lectures, so as to separate the Medical from the Pharmaceutical instruction, would make the institution available for both purposes. It is not desirable for the Pharmaceutical student to extend his studies beyond his own legitimate sphere, in which there is quite enough to occupy his whole attention. In the event of this mutual arrangement being effected, the nature of the education will be adapted to the demand, and this will be regulated by the amount and description of qualification from time to time required by the Board of Examiners. There is at present a great deficiency in the means afforded to the Pharmaceutical students for qualifying themselves. The School of Pharmacy in London can only accommodate a limited number as regular students, and a very large proportion of the Apprentices throughout the country are unable to avail themselves of this establishment. We anticipate that a School or Schools on a more extended scale will ultimately be found necessary, and that it will become the usual custom for students, at the close of their apprenticeship, to come to London for a year for the purpose of completing their education. In the mean time every advantage should be taken of available opportunities of improvement wherever they may exist, and those who cannot obtain a complete education in head quarters, should, if within reach of a provincial School, attend such lectures as may be adapted to their wants, and make up the deficiency by private study."

Certainly if we may judge by the failure of the School of Pharmacy in London, no hope could be entertained of the success of similar schools in the provinces, and we are of opinion that they would not answer as separate establishments either in Liverpool, Manchester or Birmingham. In our opinion the only thing feasible is the proposition that "Where a Medical School exists, the establishment of a Pharmaceutical branch for the benefit of Chemists and Druggists may, in some instances, be found practicable and advantageous."

We have further remarks to make on this subject, which we defer until we treat of the Pharmacy Bill.

ON A NEW SOLVENT FOR EXTRACTING CANTHARIDIN AND ON THE EXISTENCE OF THAT PRINCIPLE IN CANTHARIS VITTATA AND MYLABRIS CICHORII.

BY MR. WILLIAM PROCTER, JUN.

THE remarkable solvent power possessed by chloroform that has already been developed, and especially the discovery of Rabourdin, that some of the vegetable alkalies come within its capacity, led me to query whether it would not also dissolve the active principle of cantharides. On making trial with some pure cantharidin it was found to dissolve it with great readiness.

An ounce (480 grs.) of Spanish flies in powder, and two ounces of chloroform, were macerated together for forty-eight hours, and thrown on a glass percolator, the diaphragm of which consisted of a thick sheet of lint, and fitted with a cover to prevent loss by evaporation. The superior density of the menstruum causes the flies to float in it, for which reason it is better, after the solution has drained off, to place a heavy diaphragm on the flies, and return the solution to the percolator; after it had passed a second time, a little chloroform was added, and finally alcohol .835, until all the first menstruum has passed, which is known by the difference in density and color of the alcoholic liquid, which contains the brown color left by the chloroform.

By spontaneous evaporation, the dark green chloroform solution yielded a crop of crystals of cantharidin, admixed with the green fixed oil peculiar to the insect; the whole residue weighed forty-three grains. After standing forty-eight hours, that the crystals should have time to separate, the whole was thrown on several thicknesses of filtering paper to absorb as much as possible of the oil. The crystals were then dissolved in a mixture of chloroform and a little alcohol, and by spontaneous evaporation were obtained in nearly a pure form.

The particular merits of chloroform as a menstruum in making cantharidin, are, that it is a better solvent than ether or the oils; that a less quantity can be used with more effect, employing alcohol to displace it, and that the cantharidin crystallises more readily from chloroform than from ether. The expensiveness of chloroform precludes its use in the preparation of the ordinary blistering liquids or tissues, but where the object is to isolate the cantharidin, the advantages above-mentioned, together with the fact that most of the chloroform may be regained by distillation, will render its use altogether eligible.

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Cantharis vittata. Not being aware of any chemical examination of this insect with a view to demonstrating the existence of cantharidin in it, I have applied the solvent property of chloroform to this purpose. One hundred and twenty grains of the flies, reduced to powder, were percolated with chloroform, slowly added, until three times the weight of the flies had passed. The tincture had a greenish brown color, the brown predominating. A few drops of this, by evaporation on glass, deposited a coating of minute crystals visible to the eye, and their shape discoverable with a common lens. The whole of the chloroform solution was then suffered to evaporate in a suitable vessel, and yielded a residue of twelve grains. This consisted of crusts of minute crystals admixed with a greenish brown fixed oil, the latter in much less quantity than the green oil obtained in the same manner from Spanish flies. The whole was laid on thick filtering paper to absorb the oil, the crystalline matter dissolved in a little chloroform and alcohol mixed, which by spontaneous evaporation yielded it in a much purer form, though not entirely colorless. The cantharidin appears to be associated with less fixed oil in the potato fly than in the Spanish insect; the oil has much less color and is more fluid. The cantharidin separates in sword-shaped prisms, terminated obliquely.

Mylabris cichorii.—Having in my possession a specimen of the Chinese blistering fly, Mylabris cichorii, the same trial was made with it. One hundred and twenty grains, in powder, was percolated with chloroform till exhausted. The solution possessed a deep brown color, without a tinge of green. A few drops evaporated yielded a crop of crystals admixed with a transparent brown oily matter. The crystals were larger than those yielded by either of the preceding flies under the same circumstances. The tincture was then suffered to evaporate spontaneously, and yielded an oily crystalline residue, weighing fourteen grains. The crystalline matter was separated from the brown oil by absorption with filtering paper, and was purified in the same manner as in the preceding experiments. The crystals correspond in shape with cantharidin from the two varieties of cantharis.

In stating the weight of the chloroform extract obtained from each of the three species of insects examined, no conclusive evidence can be drawn relative to their activity, as in the two first experiments the flies were not exhausted. Besides the amount of oil and coloring matter varies, and as the whole of the cantharidin in neither case was isolated from the extract, its absolute amount is undetermined. The fixed oil must be well pressed out from the crystals before purifying them by recrystallisation.

In order to feel assured that the substances obtained were really the blistering principles of the insects, a small quantity of each mixed with a little oil was applied to my arm, and left on for eight hours. Vesication had occured before their removal in each instance, but more perfectly with the Spanish and Chinese flies than the indigenous variety, owing, as was afterwards observed, to the crystals of cantharidin in the latter substance not being properly comminuted and disseminated through the oil. On the application of cerate, however, they were all equally developed.—*American Journal of Pharmacy.*

NOTE ON THE POISONOUS PROPERTIES OF THE LACTESCENT HUMOR SECRETED BY THE CUTANEOUS PUSTULES OF THE SALAMANDER AND THE COMMON TOAD.

BY MM. PIERRE GRATIOLET AND S. CLOEZ.

It is a very ancient and widely spread opinion among the vulgar, that the salamander (*Lacerta Salamandra*, Linn.), possesses a very subtle venom. This opinion has been, in our days, classed among fables. However, great bitterness is attributed to the viscid and lactescent liquid secreted by the cutaneous pustules of this hideous animal.

An accidental observation some years ago gave us reason to doubt the innocuity attributed to this animal. Several frogs, placed in a tub with some salamanders were found dead at the end of a week; this fact, gave rise to suspicions on our part which we determined to clear up. Now, having lately received several very healthy salamanders, we immediately commenced our extracted experiments.

The liquid from the cutaneous pustules of the salamander is of a fine white. It has a very powerful virous odor. At the moment of extraction from the pustule which secretes it, it flows like a thick milk; but it soon coagulates: the action of alcohol renders its coagulation instantaneous. We have proved that it has a very distinct acid reaction.

A small quantity of this humor, placed under the skin of the wing or thigh of a small bird, did not appear to possess the

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causticity attributed to it, for the bird was not at first inconvenienced by it. But in two or three minutes, a singular perturbation was manifested. The feathers bristled, and the animal staggered. Symptoms of extreme anguish were very soon manifested; the bird then kept its beak open, and made it chatter convulsively; at the same time, it stretched itself out more and more, threw its head back, and uttered plaintive cries, was agitated, turned several times, and speedily died.

A Yellow Hammer, wounded in the wing died in a fit in less than three minutes. A Chaffinch likewise wounded in the wing died in 25 minutes after two epileptiform fits. Several other birds died in six or seven minutes; death occurs so much the sooner as the flow of blood from the little wound is less abundant. A Yellow Hammer wounded in the thigh, lost much blood; death occurred only at the expiration of twenty-two hours; during the last twelve hours, it remained in a state of sunnolency disturbed at short intervals with slight convulsive shocks. We should add that two hours after the operation, it was made to respire ammonia, which appeared somewhat to diminish its anguish, and singularly to retard the progress of the symptoms.

We considered it necessary to try the action of the poison on larger birds. A turtle-dove, slightly wounded in the wing, died in twenty minutes after terrible convulsions and alternate paralysis, which tormented the animal from the eighth minute.

All the birds submitted to the action of the milky liquid of the Salamander suffered epileptiform convulsions.

We inoculated several mammiferous animals, such as guinea pigs and mice, with a small quantity of milky liquid under the skin of the thigh. All these animals, at the expiration of ten minutes, manifested great anguish. The respiration was at times rapid and painful. They slept every instant, and this sleep was interrupted by slight convulsions, like electrical shocks. But at the end of a few hours these symptoms were dissipated, and the wounded animals were restored to health.

Thus, a quantity of millky juice, sufficient for killing in a few minutes a bird of the size of a turtle dove caused only a few passing convulsions in a mouse. Now, a turtle dove being so much larger than a mouse, the reason of this action must be sought for only in the nature and organisation of the animals wounded. To sum up:—

The mammiferous animals experimented on had convulsions, but these convulsions were not mortal.

To these preliminary experiments, we add some observations on the lactescent liquid contained in the dorsal and parotid pustules of the common toad (Rana bufo).

This liquid is thick and viscid: it is of a yellowish tint; it has a virous odor, and an insupportably nauseous bitter taste. One of us having tasted more of it than he wished, was enabled to say that it makes no painful impression on the mucous membrane of the month: we think, consequently, that the acridness attributed to it is owing to its admixture with other liquids which we intend to examine. Like the liquid of the salamander, it has a powerfully acid reaction.

We inoculated five small birds with the lactescent humor of the common toad; all died in five or six seconds, but without convulsions. They opened their beaks and staggered, as when intoxicated; they had, evidently, lost the faculty of controling their movements. In a short time, they closed their eyes as if to sleep, and died.

If we compare the general results of these experiments, we may thus sum them up: the lactescent humor of the salamander and that of the toad are, as regard birds, equally energetic poisons, but the venom of the salamander kills after terrible convulsions, and that of the toad does not cause convulsions.

We have proved that the liquid of the pustules of the toad kills birds, even after being dried. Two milligrammes of this dried venom killed a green finch in fifteen minutes. This liquid likewise acts after its acid has been saturated with potassa.

We have not yet sufficiently appreciated the anatomical lesions which follow the action of these venoms; however, we always found in birds thus killed very considerable cerebellic apoplexy.—*Répertoire de Pharmacie.*

ACTION OF MERCURIAL OINTMENT.

BY BERENSPRUNG.

THE action of mercurial ointment employed in frictions is indisputable, and can only be explained by admitting that mercury, under some form or other, penetrates the epidermis and the subjacent cutaneous parts, to come into contact with the blood and the internal portions of the body.

But, in what state is the mercury when it thus penetrates the epidermis? Is it in the state of quick-silver? Certainly not; for MM. Béclard and Krause have demonstrated that it could not penetrate, even under a pressure of 26 inches.

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Nor is it in the state of very finely divided mercury, which is the state in which it is admitted to exist in mercurial ointment. In this respect, MM. Autenrieth and Zeller formerly made a very ingenious experiment. Into a wound ready to be closed, they introduced small and very thin plates of gold, covered them completely, and thus made them in some measure part of the living being. They then rubbed the epidermis with mercurial ointment for a sufficient length of time, after which they made an incision, extracted the gold leaves and examined them. They had not undergone the slightest alteration, which shows that no metallic mercury had reached them.

The result of this experiment having been disputed by Oersterlen, Dr. Berensprung thought it advisable to repeat numerous experiments, in order to throw new light on the subject.

He took animal membranes, skins of the bladder, of the pig, the calf, and the sheep, which he stretched over a vessel so as to have an apparatus similar to those employed for endosmose. Sometimes the membranes were dry, and sometimes they were moist; sometimes also they were impregnated with fatty matter, so as to render them more permeable to the ointment. He then rubbed one of the surfaces with mercurial ointment for several hours without ceasing; then he examined the other surface, either with the aid of a good microscope, or by means of a leaf of gold. Never, in any experiment, did he find the slightest trace of mercury.

It is not, therefore, in the metallic state that mercury penetrates, even when it is very finely divided. Neither is it in the state of vapor, as the author ascertained, since by wrapping gold leaf in a very thin animal membrane, and holding it suspended over a vessel containing mercury, no kind of alteration was discovered, even when the mercury was heated and the experiment was continued for several weeks.

But then, under what form does the mercury penetrate into the economy?

Here the author considered it necessary to make an accurat analysis of mercurial ointment, and to ascertain whether the mercury would not be found in a peculiae state of combination which would permit this penetrations to be easily operated, and enable it to arrive in the blood in order to produce its remarkable and well-known action.

When a certain quantity of mercurial ointment was fused in a small tube, the metal was seen to separate from the fatty matter, so that the liquid presented two distinct layers,—the lower one, which was white, consisted of quicksilver, and the upper one, which was yellow, was the melted fatty matter. But, between these two layers, there was, however, distinguished a third, formed of a very small quantity of black matter which was readily ascertained to be protoxide of mercury. And, indeed, treated by cold water very slightly acidulated, it readily dissolved, which would not be the case if the mercury were in the metallic state, and the solution presented all the characters of the protosalts of mercury. Moreover, the quantity of this matter is excessively variable; it is very small in recently prepared ointment, and increases greatly as it becomes older. It has also been remarked that the blue color of mercurial ointment becomes much deeper with time, until it sometimes becomes perfectly black.

There is therefore no doubt in this respect: mercurial ointment always contains mercury in the state of black protoxide, and the quantity of the latter increases with the age of the ointment. But what part does this protoxide of mercury play?

Mr. Donovan and Dr. Christison had already proved its presence in mercurial ointment, and they had even ascertained that the mercury thus protoxidised constituted one-fifth of that which was in the metallic state. M. Guibourt had also made a similar analysis, and found only $\frac{1}{300}$ of protoxide, and he also stated that this protoxide was combined with a peculiar acid. Between these two different assertions, it was important to have new and precise experiments to learn the limits between which the proportion of protoxide existing in the ointment might vary, and, finally, to ascertain whether this protoxide, even in the very small quantity in which it exists, may not be the actual cause of the action exerted by the ointment.

Dr. Berensprung has answered these questions He first ascertained that if metallic mercury is incapable, however finely divided, of traversing the cutaneous tissues, it is not the same with the protoxide of mercury, and that the latter, on account of the facility with which it dissolves in the acids of the secretions, is carried, as by means of a vehicle, through the membranes and cellules of the epidermis, to the innermost parts of the system.

He afterwards ascertained that the quantity of this protoxide of mercury needs not to be considerable for producing great effects, and the experiments which he has made on this subject are sufficiently curious to be detailed.

He prepared a pommade composed only

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of lard and protoxide of mercury in the following proportions.—

Lard ..... 2 drachms.
Black oxide of mercury.. 1 „

This pommade, which did not contain as much mercury as ordinary mercurial ointment, acted as a true poison on animals rubbed with it. 24 grains of this pommade killed a cat in four days, and the same quantity killed a rabbit in twenty-four hours.

He prepared another pommade in the following proportions:—

Black oxide of mercury.... 1 grain.
Lard..... 1 drachm.

He employed this pommade as a substitute for ordinary mercurial ointment. The numerous experiments which he made on patients convinced him that such a pommade would act in the same manner and with the same degree of energy.

It was sufficient, therefore, to be right in referring the action of mercurial ointment to the protoxide of mercury which it contains, to prove, by analysis, that the quantity of this oxide forms about $\frac{1}{72}$ of the mercury left in the ointment in the metallic state. Now, this proportion is indeed the mean of the analyses hitherto performed of both recently prepared and old ointments.

This remarkable result at which the author has arrived, as regards mercurial ointment, may likewise be applied, and as correctly, to the whole of that series of preparations which are obtained by triturating mercury with various substances, but which are destined for internal use, as; ethiops per se, hydrargyrum cum creta, (Ph. Lond.), hydrargyrum cum magnesia, (Ph. Dub.) ethiops graphiticus, (Ph. Sax.) Mercurius gummosus Plenckü, ethiops saccharatus, ethiops tartarisatus Sellü, pilula hydrargyri (Ph. Lond.)—*Journal de Pharmacie*, August, 1851.

TAR IN SKIN DISEASES.

BY M. CAZENAVE.

M. CAZENAVE, in his *Annales des maladies de la peau*, publishes various formulæ containing tar, and which he recommends in prurigo, lichen, porrigo, acne and lycosis. M. Emery had already, and justly, spoken in high terms of the use of tar in psoriasis and lepra vulgaris. Tar pommade is rubbed on the affected parts, and not being irritating may be largely used.

TAR POMMADE.

℞ Tar from 4 to 10 grammes.
Lard ..... 30 grammes.

According to the case, camphor or laudanum may be added, but, M. Cazenave has more often preferred mixing it with citron ointment in the following manner.

℞ Citron ointment.. }
Tar ..... } aa. 10 grammes.
Lard ..... }

This pommade should be more moderately used than the preceding; it is rubbed on the squamous patches.

Besides this external application, tar is employed internally, as is well known, in chronic bronchitis, hooping cough, the commencement of phthysis, chlorotic and scorbutic affections, leucorrhea, affections of the mucous membrane, of the bladder and urethra, etc.

Tar water and pills are usually taken. M. Sutro, a German physician, has used it pure; he gave gelatinous capsules containing ten drops of pure Stockholm tar, and found it rendered the digestive functions more active. The formulæ most approved of by M. Cazenave are these:

TAR WATER.

Tar..... 200 grammes.
Water ..... 1000 „

In the dose of half a wineglassful, and afterwards a wineglassful, twice a day.

PILLS OF TAR.

Tar..... 2 grammes.
Liquorice powder..... 1 „

F. S. A. 40 pills; from one to three a day.
—*Annales des Maladies de la peau.*

NEW MODE OF TESTING OPIUM.

BY MM. DESMEDT & BROTHERS.

AFTER studying the processes of MM. Devry, Gregory and Guilliermond, MM. Desmedt purpose the following process.

60 grammes of raw opium are treated by 240 grammes of boiling alcohol at 71° cent. it is decanted while hot and the grounds are put in the press after cooling; the grounds are then treated in the same manner with 160 grammes of alcohol of the same degree; these several alcohates are collected in a hermetically sealed phials and left to deposit until the next day.

A magnificent crystallisation of narcotine is then found which is separated from the alcoholic liquid. This liquid is put into a wide mouthed phial and 4 grammes of ammonia are added; a considerable quantity of pure morphine will be thus obtained which is to be separated from the liquor. This done a small quantity of distilled water is added to the alcoholic liquor, keeping the phial at a temperature of 75°F. for two days. After these two days a fresh quantity of morphine will be ob-

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tained, less pure than the first, but free from narcotine.

By the process of the exhaustion of opium by alcohol, the authors have obtained 5 grammes of morphine from 60 grammes of opium employed.—*Journal de Chimie Médicale*, August. 1851.

CHLOROFORM IN INTERMITTENT FEVERS*

BY DR. GIRAUDET.

THE author gives the summary of five observations of intermittent fevers. Of these five patients, two, treated at first by quinine, were only definitively cured by chloroform; in two others, this medicament, administered in the first instance, succeeded completely: in the fifth, which was a case of quartan ague, the result was negative. The formula employed by the author was 200 grammes of simple syrup, containing 6 grammes of chloroform; two spoonfuls to be taken, one, two hours before the fit, and the other at the commencement of the shivering.—*Société des Sciences Médicales de Gannat.*

TREATMENT OF VARICOSE ULCERS BY OAK BARK.

BY DR. RODES.

A PATIENT having varices on both legs and atonic ulcers, was uselessly submitted to a long treatment by quinine and rhatany under several forms, chloruretted lotions, &c. The author then thought of employing the concentrated decoction of oak bark to wash the wounds, moistening the lint and compresses with it. He applied the powder of the same bark directly on the ulcers. Soon after, the wounds became red, and rapidly cicatrised. Encouraged by this result, our colleague has ever since adopted this treatment, and has always obtained good effects.—*Societe Médicale de Gannat.*

EMPLOYMENT OF CEDRON IN FEVER AND DYSENTERY.

CEDRON is a medicine which deserves serious attention, and which appears, from a statement in the *Philadelphia Medical Examiner* to be employed in California. The diseases most common in that country are miasmatic fevers, rheumatism, pulmonary diseases, and all those which are observed in cold and damp countries. The first prevail in Summer the others in Autumn, Winter, and the commencement of Spring. The fevers are more especially intermittents of the tertian and quotidian types, and serious remittents. They prevail principally in the course of the great rivers; they are extremely common on the banks of the Sacramento and in the town of that name, which is frequently inundated by the river. The emigrants who swarm into California are decimated by typhoid fever, phthysis pulmonalis, scurvy, diarrhœa and especially, dysentery, which, at San Francisco assumes a serious form. In the country it is treated with the fruits of the cedron which are given in doses of 50 centigrammes and upwards, and which are considered superior to quinine.

Some experiments tried in the hospitals of Paris with the seeds of the cedron employed as a febrifuge promise the most happy results.—*Répertoire de Pharmacie*, Aug. 1851.

POISONING BY PHOSPHORUS.

BY DR. BOUDANT.

M. V., aged 54 years, of irascible disposition and continually over-excited, by his habits of intoxication, resolved to terminate his existence. On the 7th of July, 1848, he bought a pot of phosphuretted paste. On the 8th, being stupefied with two bottles of white wine and about a pint of brandy, he swallowed, alone or spread on bread, half of the paste contained in the pot. Seven or eight hours after this fatal breakfast, V. complained of ardent thirst and violent heat in the mouth, back of the throat, œsophagus and stomach. Water, which he took continually, afforded no relief. To these symptoms succeeded violent pains, followed by continual vomiting. MM. Audiffred and Danval were then called in, and were as ignorant as the family of the cause of illness. The pulse was hard, strong and frequent. Copious bleeding, emollient drinks, cataplasms to the epigastrium. Slight improvement at first; but during the night the above-mentioned phenomena reappeared with still more violence, complicated with desire to make water, accompanied by strangury: 30 leeches to the epigastrium, a calming draught Seltzer water mixed with water. No improvement; the pains in the stomach extended to the intestines. Our two colleagues, having become acquainted, on the 10th. with the poisoning by phosphorous, redoubled their efforts, but in vain. V. died in three days in frightful torture.—*Société Mèdicale de Gannat.*

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A SUBSTITUTE FOR COLLODION.

BY DR MELLER.

DR. MELLER gives in Buchner's Repertorium the formula of a mixture which he considers a real substitute for collodion.

Pulverised shell-lac is dissolved in highly rectified spirit of wine: the solution assumes on cooling, a demi-solid and gelatinous consistence. This is the mixture used by upholsterers for polishing furniture.

Spread on linen or silk and applied to the skin, it has all the properties and advantages of collodion; thus, it is impenetrable to air, water, oil and even to organic humors and secretions. It in no way irritates the skin, and adheres to it perfectly. Its adherence is so perfect that it might replace dextrine in cases of fracture.

The author affirms that wounds cure rapidly when covered with this mixture.—*Journal de Pharmacie et de Chimie* August, 1851.

DETECTION OF PHLORIDZIN IN DISULPHATE OF QUININE.

PUT the suspected salt in a porcelain capsule and pour over it a few drops of nitric acid. If no change of color result phloridzin is absent. Should, however, phloridzin be present, the mixture becomes first yellow, then green, and finally dark brown.—*Journ. de Pharm. d'Anvers.*

CASE OF POISONING BY TINCTURE OF ACONITE.

BY JOHN TOPHAM, M.D. LOND.

A WOMAN aged 27, laboring under the effects of enæmia, conjoined with leucorrhœa and gastrodynia, had a prescription given her, consisting of citrate of quinine and iron, dissolved in water. The dispenser, owing to some error in compounding, added half an ounce of tincture of aconite to the eight-ounce mixture ordered. At eleven o'clock in the morning, she took one tablespoonful of the above compound, and immediately felt a sensation of numbness in the tongue, accompanied by difficulty of swallowing; soon afterwards she began to cry violently, this act being accompanied by convulsive twichings of the facial muscles. Immediately after this she lost the power of walking, and began to eject a quantity of mucus from the stomach. At half-past two o'clock I saw her, and observed the following symptoms, which, joined to the details just mentioned, caused me to suspect that aconite had been taken. She was lying on a sofa, resting upon her back, with her eyelids closed, and the pupils slightly contracted. She was quite unconscious when spoken to, and during an hour's observation, she only spoke intelligibly twice, and then said, "What is it?" Every now and then she uttered a peculiar plaintive cry. She was continually moving her tongue round the interior of her mouth, from time to time thrusting the organ out beyond the lips, and moving it from side to side. The pulse was weak, but regular. The bystanders said that it had been intermittent. The hands and feet were cold. There was constant lachrymation, insomuch that a woman was continually wiping the sufferer's eyelids with a handkerchief. The intensity of symptoms varied greatly; sometimes she would lie quite still for several minutes, and then all at once be seized with a paroxysm of sighing, every now and then exclaiming, "What is it?"

I gave her sesquicarbonate of ammonia, with compound tincture of cardamoms, and hot brandy and water, ordered her bed to be warmed, and had her taken upstairs. Having, to a certain extent rallied, she managed to go up a steep staircase, assisted by one person. She said that "her face felt very large," and that "all her teeth were coming out." During the night she had very little sleep, her rest being disturbed by dreams that she was falling from a height.

The next day she complained of pain in the lower part of the back, and of numbness in both arms, but these sensations soon subsided, and no ill effects remained. After recovering, she stated that she had not the slightest recollection of what had occurred during two hours—*i. e.*, from half-past twelve till half-past two o'clock.

Remarks.—The above is a good illustration of the effects of a poisonous dose of a preparation of aconite. At the first sight the symptoms might have led to suspicion that hysteria was the cause of the phenomena observed, but the sudden loss of sensation in the branches of the fifth nerve distributed upon the mucous lining of the tongue and the interior of the mouth, followed by vomiting, paralysis of sensation in the arms, &c., sufficed to suggest that poison had been taken, and that that poison was *aconite*.

The case also illustrates the uncertainty in the effects produced by the preparations of this substance, and suggests the degree of care that should be taken in prescribing them.

The exact quantity of aconitina contained in the tincture given in the present

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instance it is impossible to determine, owing to the inadequacy of our tests for that alkaloid; but upon enquiry at the manufacturer's, it was found that the tincture had been prepared by macerating four ounces of the root in one pound of spirit. Of this the patient had taken fifteen minims; a small dose, but one which, from a remark made by Professor Taylor, upon the authority of Dr. Pereira, would appear amply sufficient to occasion dangerous symptoms.* Of course the strength of the tincture employed must be here taken into account, and this varies extremely; that prepared according to Dr. Flemings directions consisting of powdered tubers and rectified spirit, in the proportion of sixteen ounces (Troy) to sixteen fluid ounces, and there being some five or six other formulæ known.† Pereira states that the 50th part of a grain of aconitina has sufficed to endanger the life of an individual;‡ and the late Dr. Male, of Birmingham, died from the medicinal effects of eighty or eighty-seven drops of Fleming's tincture, taken at ten doses over a period of four days, the largest quantity swallowed at one dose being ten drops,§ whilst a case of recovery, after a dose of *two grains and a half* of aconitina, has been related by Dr. Golding Bird.‖—*Lancet*, July 18, 1851.

BOOKS RECEIVED.

The Journal of the Royal Agricultural Society of England, Vol. XII., Part I., No. xxvii. London: John Murray.

Photographic Manuals, No. I. Plain Directions for obtaining Photographic Pictures, by the Calotype, Energiatype, and other processes on Paper, including the Chrysotype, Cyanotype, Chromotype, &c., &c., with all the latest Improvements. 4th Edition with additions. Part I. Edited by John H. Croucher. London: T and R. Willats, 1851.

TO CORRESPONDENTS.

"MR. SYKES, *Liverpool.*"—In order to be enabled to give an authoritative reply to your question as to "whether the late order of the Board of Trade is considered to be still in force," concerning which you state "there appears to be considerable doubt here on account of what was said on the occasion of the remonstrances of the sailors of this and other ports whether the whole order in all its bearings was not entirely suspended," we wrote to the Secretary of the Board of Trade, giving an extract from your letter, to which we received the following reply.

(Copy.)

"Office of the Committee of Privy Council for Trade, Naval Department,
September, 13th, 1851.

SIR,—I am directed by the Lords of the Committee of the Privy Council for Trade to acknowledge the receipt of your letter of the 11th instant, and to inform you that the Scale of Medicines which was in force under the Act 7 and 8 Vict., c. 112, is still in force, but the Scale issued by the Board of Trade last winter may be used if preferred. I am to add that this arrangement will continue until further notice.

I am, SIR, your obedient Servant,
(Signed) T. H. FARRER.

J. Watt, Esq.,
Editor of 'THE CHEMIST.'"

With regard to the other question in your letter, we have requested the manufacturer to write to you. If he has not done so, please to let us know, and we will endeavor to answer you.

"A. S." is right in the conclusions at which he has arrived, and we advise him to act on them. His influence should also be exerted on others.

"MEDICUS" is referred to our No. for March, 1850.

"A STUDENT."—We recommend you to pursue the investigation further.

"INTRODUCTION TO THE STUDY OF CHEMISTRY."—Illness has interrupted this series: we shall resume them in our next and hope to be able to continue them *monthly*, instead of intervals as heretofore.

"M. P. S."—The remedy is in your own power: apply it.

Answered by post.—"Cantab," "Mr. Hall" "E. B." "H. F. S." "A Country Chemist." "A Pharmaceutist, Liverpool." "M. D." "W. B."

* Taylor *On Poisons*, 1848, p. 765; and *Medical Jurisprudence*, 1849, p. 187.

† *Pharmaceutical Journal*, 1847, p. 176.

‡ *Materia Medica*, vol. ii., 1841.

§ *Provincial Medical and Surgical Journal*, 1845, p. 535; and *British and Foreign Medical Review*, vol. xx., p. 469.

‖ *Medical Gazette*, January 6, 1848.

NOTICE.—*All Communications, Books for Review and Substance for Notice must be addressed* "To the Editors of THE CHEMIST, care of Messrs. W. & T. Piper, Paternoster Row, London." *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following Nos. will in future be received as late as the 20th*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

ON THE ANALYSIS OF ALLOYS OF COPPER AND ZINC.

BY M. RIVOT, DIRECTOR OF THE LABORATORY OF THE SCHOOL OF MINES, AND M. BOUQUET, OF THE ASSAY OFFICE.

THE processes of separating copper and zinc given in the best chemical works are based on the employment of sulphuretted hydrogen, and on that of potassa. H. Rose recommends sulphuretted hydrogen, and absolutely condemns the use of potassa, as always giving oxide of copper containing a certain proportion of oxide of zinc.

We must also mention the numerous experiments which M. Pelouze has made with the view of obtaining an easy and rapid method of analysing alloys of copper; these experiments, which are detailed in two memoirs published in the *Annales de Chimie et de Physique*, 3e Série, tomes XVI et XVII, may be regarded as models of accuracy and precision, as regards the estimation of copper.

The process of M. Pelouze consists, as is known, in precipitating copper by a solution of known strength of hydrosulphate of soda in ammoniacal liquor; but the oxysulphuret of copper obtained is difficult to filter on account of the rapid oxidation which it undergoes in the air.

Hence the almost indispensable necessity of estimating the zinc by the difference.

Being instructed to make, for the Assay Office of the School of Mines, analyses of a great number of samples of brass, we were led to make experiments on the separation of copper and zinc, and we have proved that sulphuretted hydrogen cannot give a satisfactory result.

When we operate in a liquor which is not very acid, sulphuretted hydrogen precipitates almost all the zinc at the same time as the copper, in the state of sulphurets; when the liquor is very acid, there is always a considerable proportion of sulphuret of zinc carried away with the sulphuret of copper, whatever be the degree of acidity of the liquor.

In seeking another process of separation, we ascertained that potassa, employed with certain precautions, may very clearly separate the oxide of copper from the oxide of zinc.

We think it right to make our experiments known, as they will doubtless be interesting to those chemists who pay attention to mineral analysis.

EMPLOYMENT OF SULPHURETTED HYDROGEN.

The experiments in which we endeavored to separate weighed quantities of copper and zinc, by the employment of sulphuretted hydrogen, were conducted in the following manner:—

The two metals were dissolved in nitric acid, the nitrates were evaporated and converted into oxides, and the oxides dissolved in hydrochloric acid. An excess of sulphuretted hydrogen was passed into the hydrochloric liquor, which was more or less acid. The precipitate, containing all the copper and a portion of the zinc in the state of sulphurets, was received on a filter and washed with water charged with sulphuretted hydrogen. It was then dried, separated from

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the filter and dissolved in aqua regia. The liquor was rendered ammoniacal, and the copper was precipitated by potassa in the state of oxide. As a verification, the oxide of copper was reduced by hydrogen, and the copper was estimated in its metallic state.

The zinc was found in both liquors: first, in the hydrochloric liquor treated by sulphuretted hydrogen; secondly, in the alkaline liquor from which the copper had been precipitated by potassa.

In the former, the proportion of zinc which has escaped the action of the sulphuretted hydrogen may be estimated by adding ammonia, and hydrosulphate of ammonia. The zinc contained is precipitated in the state of sulphuret: the sulphuret is received on a filter, carefully dried, separated from the filter, and then converted into oxide by roasting and calcination.

To estimate the zinc contained in the alkaline liquor, the alkalis must be separated by an acid, and the zinc precipitated by an alkaline carbonate. The precipitate, well washed and dried, is converted into oxide by calcination.

EXPERIMENTS.

A. By operating, as we have just indicated, on an alloy of copper and zinc containing:—

	gr.
Copper	0·96
Zinc	1·04

and rendering the hydrochloric liquor before treating it with sulphuretted hydrogen, sufficiently acid to distinctly redden litmus paper, but without measuring the quantity of acid, we obtained, in three experiments, for the quantity of zinc not precipitated by sulphuretted hydrogen:

	gr.
1st Experiment	0·055
2nd „	0·060
3rd „	0·080

These results show that almost all the zinc was precipitated by the sulphuretted hydrogen, and this was confirmed by the examination of the alkaline liquor after the precipitation of the copper by potassa.

B. We afterwards operated on liquors of a definite degree of acidity; we took:—

	gr.
Zinc	0·82
Copper	0·85

The two metals were converted into oxides, and then dissolved in a liquor containing:

	grammes.
Water	200
Fuming hydrochloric acid	20

By treating the liquor with sulphuretted hydrogen, and estimating the zinc not precipitated, we found:

	gr.
Zinc	0·672

which gives for the zinc precipitated at the same time as the copper:—

	gr.
Zinc	0·148

or 18 per cent.

C. We took:—

	gr.
Zinc	1·10
Copper	1·10

The metals were converted into oxides, and the latter dissolved in a liquor composed of:—

	grammes.
Water	200
Fuming hydrochloric acid	50

By operating as above, we found:

	gr,
Zinc not precipitated by sulphuretted hydrogen	1·016*
Zinc precipitated by sulphuretted hydrogen	0·084

or 7·63 per cent. of zinc precipitated by sulphuretted hydrogen.

In this experiment, the estimation of the copper gave us:—

	gr.
Oxide of copper precipitated by potassa	1·39

and, by reducing the oxide of copper by means of hydrogen, we obtained:—

	gr.
Metallic copper	1·098

We ascertained that after the precipitation of the copper, the alkaline liquor contained a very considerable quantity of zinc.

D. By operating on a mixture of:—

	gr.
Copper	1·00
Zinc	0·54

and dissolving the oxide in a liquor composed as in the foregoing experiment, of:—

	grammes.
Water	200
Fuming hydrochloric acid	50

we obtained, by the employment of sulphuretted hydrogen:—

	gr.
Zinc not precipitated	0·416
Zinc precipitated	0·124

or 22·90 per cent. of zinc precipitated by sulphuretted hydrogen.

* In our calculations we have taken as the equivalent of zinc the number 406, and for that of copper the number 395. We have verified the latter number several times, by converting into oxide determined weights of very pure metallic copper, and regenerating the metallic copper by hydrogen.

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The estimation of the copper gave us:—

	gr.
Oxide of copper precipitated by potassa	1·250
Copper resulting from the reduction of the oxide by hydrogen	0·995

E. By operating in the same manner, and with the same proportion of water and hydrochloric acid, on a mixture composed of:

	gr.
Copper	0·70
Zinc	1·20

we obtained:—

	gr.
Zinc not precipitated by sulphuretted hydrogen	1·088
Zinc precipitated by that reagent	0·112

or 9·30 per cent of zinc precipitated at the same time as the copper by sulphuretted hydrogen.

The estimation of the copper gave:—

	gr.
Oxide of copper	0·870
Copper (by the reduction of the oxide by hydrogen)	0·692

F. We operated on the mixture:—

	gr.
Copper	1·00
Zinc	1·04

The two metals were converted into oxides, and the latter dissolved in a liquor containing:—

	grammes.
Water	125
Fuming hydrochloric acid	125

The solution was, consequently, much more acid than the liquors ordinarily employed in the analyses.

The sulphuretted hydrogen precipitated all the copper, but at the same time, a certain quantity of zinc; we found:—

	gr.
Zinc not precipitated by sulphuretted hydrogen	0·920
Zinc precipitated by that reagent	0·120

or 11·54 per cent. of the zinc precipitated at the same time as the copper.

These experiments appear to us to prove that sulphuretted hydrogen cannot be employed alone for the separation of copper and zinc; that however acid the liquor into which the sulphuretted hydrogen is passed, the sulphuret of copper carries along with it a variable, but always a very considerable proportion of zinc.

From these experiments it likewise results that if we dissolve in aqua regia the precipitate given by sulphuretted hydrogen, and if the copper be precipitated in the state of oxide by potassa, in the liquor previously rendered ammoniacal, we arrive at very accurate results as regards the estimation of the copper.

EMPLOYMENT OF POTASSA.

We were thus led to employ potassa for the separation of the two metals. This process of separation was, moreover, recommended by Vauquelin, in a *Note on the analysis of brass*, inserted in the *Annales de Chimie*, 1re Serie, t. XXVIII.

Vauquelin recommended dissolving the brass in nitric acid, precipitating the solution cold, in a close vessel, by potassa, saturating the filtered liquor with sulphuric acid, and precipitating the zinc with carbonate of potassa.

This process gave us very good results, but we have found it advantageous to precipitate the oxide of copper by means of potassa only after having rendered the liquor ammoniacal. The oxide of copper obtained does not contain oxide of zinc, nor does it retain any potassa, whereas, in operating on a non-ammoniacal liquor, it is almost impossible to remove all the potassa from the oxide of copper by even prolonged washings with boiling water.

The precipitation of the oxide of copper by potassa, in an ammoniacal liquor, takes place very well at a temperature varying from 158° F. to 176° F.; if a higher temperature be employed, the oxide of copper attaches itself powerfully to the sides of the vessel, and it is necessary to redissolve it in an acid and to precipitate it *de novo*.

It is necessary to operate only on dilute liquors, and not to employ too great an excess of potassa; in concentrated liquors, or with an excess of alkali, the oxide of copper obtained retains with tenacity a larger proportion of potassa.

PROCESS OF ANALYSIS.

To analyse an alloy of copper and zinc, we operate as follows:—

We dissolve the alloy in nitric acid; we dilute with water and saturate the acid with ammonia; into the ammoniacal liquor we put a slight excess of pure potassa in pieces, and we heat gently on a sand-bath until the decoloration is complete, or until the liquor has no longer an ammoniacal odor. We filter and wash the oxide of copper in boiling water.

To the alkaline liquor we add hydrochloric acid until the reaction becomes acid, and then we precipitate the zinc by means of carbonate of soda. Before filtering, we heat for seven or eight hours on a sand-bath, in order to drive off the free carbonic acid. The precipitate is then filtered, washed with boiling water, dried, separated from the filter and calcined.

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The two metals are thus estimated in the state of oxide. We have analysed by this method the two mixtures:—

	gr.	gr.
Copper	1·00	0·70
Zinc	1·00	1·10
and we obtained	gr.	gr.
Oxide of copper ..	1·25	0·870
Oxide of zinc	1·260	1·350

corresponding to zinc 1·008gr., 1·08gr.

By reducing the oxide of copper by hydrogen, we obtained:—

	gr.	gr.
Metallic copper..	0·997	0·692

When the proportion of zinc is very great, we effect the separation much more easily by employing sulphuretted hydrogen first, redissolving the precipitated sulphuret in *aqua regia*, rendering the solution ammoniacal, and precipitating the copper with potassa. The estimation of the copper is then very accurate, but that of the zinc is less so, because it is divided into two parts. It is true, the two liquors containing the zinc might be mixed, after having driven off the sulphuretted hydrogen of one by heat, and after having rendered the other acid, and then precipitating the zinc at one operation. But in a liquor thus composed, that is to say containing a certain quantity of a salt of potassa, the zinc cannot be precipitated in the state of sulphuret. The rapid oxidation which this sulphuret undergoes in contact with the air is opposed to its being washed for a long time, which would be necessary for removing from it all the salt of potassa. The carbonate of soda must, therefore, be employed, and, in this case also, the precipitate is so much the more difficult to wash as the mass is greater. We have obtained very satisfactory results by dividing the estimation of the zinc into two.

Thus, in the experiments above mentioned, (D, E, and F), in which we operated on the following quantities of zinc:—

gr.	gr.	gr.
0·54	1·20	1·04

we obtained on one hand:—

Zinc not precipitated by sulphuretted hydrogen, afterwards precipitated from the hydrochloric liquor by ammonia and the hydrosulphate, then estimated in the state of oxide,

gr.	gr.	gr.
0·416	1·088	0·920

Zinc precipitated from the acidified potassa solution, by carbonate of soda and estimated likewise in the state of oxide.—

gr.	gr.	gr.
0·117	0·109	0·115

which gives for the total zinc obtained in the three experiments:—

gr.	gr.	gr.
0·533	1·197	1·035

numbers sufficiently near to the quantities of zinc employed.

The results which we have just enunciated appear to us sufficiently satisfactory to prove that the separation of zinc and copper succeeds very well by the employment of potassa, or, indeed, by the employment of sulphuretted hydrogen and potassa.

As regards sulphuretted hydrogen alone, it always gives very inaccurate results.

Moreover, sulphuretted hydrogen, as an agent for separating metals in acid liquids often leads to imperfect results. Thus, this reagent cannot be employed for separating lead from zinc. It gives even more inaccurate results than in the case of copper and zinc. The reason of this is very simple: copper may be entirely precipitated by sulphuretted hydrogen in a very acid hydrochloric liquor, whilst the precipitation of lead succeeds well only in a dilute and only slightly acid liquor; now, in this case, almost the whole of the zinc is precipitated at the same time as the lead. In the laboratory of the School of Mines, we have had several examples of the complete precipitation of zinc in the analyses of minerals containing blende and galena, and in which the proportion of the blende exceeded 50 per cent.

Thus, also, in the analyses of alloys containing nickel and copper, sulphuretted hydrogen, employed for the separation of the two metals, always precipitates with the copper a very considerable proportion of nickel, even when the hydrochloric solution of the two metals is extremely acid.

We will not now dwell any longer on this subject, but will hereafter make known the results of the experiments which we have undertaken on the employment of sulphuretted hydrogen in analyses.—*Annales de Chimie et de Physique*, September, 1851.

ON THE CHEMICAL AND GENERAL EFFECTS OF THE PRACTICE OF INTERMENT IN VAULTS AND CATACOMBS.

BY WALLER LEWIS, M.B. CANTAB., F.G.S.

MUCH has been said and written on the decomposition of the human body after interment in the ordinary, and I may be allowed to call it, the natural mode—i.e., when buried in the earth. Very little, however, has been published on the process and results of such decomposition, when these are modified by the corpse being placed in a vault or catacomb. Even this little is incor-

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rect in almost every important particular. I have been engaged for many months, in the years 1849 and 1850, in inspecting the greater part of the vaults of the churches of the metropolis for the General Board of Health; and as I hope that in a short time the practice of entombment in receptacles of this kind will be prohibited, and the vaults themselves closed for ever, I consider it a matter of importance that some of the circumstances connected with these inquiries should be laid before the public.

Before the Report of the General Board of Health on Extramural Interments was laid before Parliament, the latest information we were in possession of was contained in a leading article in the *Times* newspaper, in the month of September, 1849. This was called forth by a regulation issued by the Board of Health, during the prevalence of the late epidemic cholera. By this regulation, the authorities were enjoined not to allow any corpses to be placed in vaults, except they were in "air-tight leaden coffins." The following sentences are extracted from this article:—

"It is a dismal duty, and one which we do not very willingly undertake, to descend into the gloomy abodes of the dead—to make so to speak, a show-box of the coffin, and to direct the public gaze on the shrouded slumberer within. It is, indeed, no beautiful spectacle, the so-called rest of a corpse after its soul has departed; and to observe how the dead man strives, after his fashion, to escape from the subterranean imprisonment with greater force than ever in life he could have exerted to tear asunder galling manacles, or burst through dungeon walls. These remarks may serve to explain the disapproval which we feel it our duty to express of an order just issued by the Board of Health, enjoining, as a condition of burial in intramural vaults, the use of air-tight leaden coffins. This order, manifesting, as it does, an inexplicable ignorance or disregard of the true objects and inevitable results of sepulture, requires at our hands a condemnation the more unqualified and explicit, as the previous measures of the Board, having been uniformly well-timed and judicious, may lend to this inconsiderate ordinance the *prestige* of a fallacious authority.

"Do the members of the Board of Health know what sort of substances they seek to confine, when they put a corpse weighing some eight or ten stone, into a box 'of sheet-lead closely soldered down?' Are they acquainted with the seventeen or eighteen chemical elements of which the human body is built up, and with the influence of confinement on the putrefactive combinations of these elements? Have they considered how, and by what process, that decomposition takes place, which leaves, at the end of ten years only, a few brittle bones in the else vacant shroud? And are they aware of the terrible retribution with which nature will punish the violation of her law, if they persist in obstructing with leaden barriers the corporeal absorption of the dead?"

"In the first place it is to be observed that the putrefaction of a corpse cannot be retarded by the exclusion of air and water from its subterranean receptacle. By withholding from the putrescent corpse a free supply of oxygen, we promote, nay we positively cause, the formation of gaseous poisons so intent that their mere contact with a mucous surface of the body may occasion sudden death,"

"The hydrogen of decaying flesh, which with a free supply of air would, by absorption of nitrogen, be chiefly converted into water, combines, within the airless coffin, with the sulphur of the hair and albumen, with the phosphorus of the bones and brain, and with the carbon of all the tissues, to form compounds all more or less noxious, and some of tremendous virulence. Among the products with which hydrogen thus combines is cyanogen, itself a compound of carbon and nitrogen, and which, with the addition of hydrogen, is converted into the terrible poison known as prussic acid; an agent so deadly, that one drop of it placed on the tongue suffices for the destruction of life."

"The pent-up gases first produced will exercise on the compounds subsequently formed, a pressure, the effect of which will be to change their composition and increase their virulence. The coffins will be bulged by the expansion of the elastic fluids generated under compression within; the acrid products of decomposition will gradually corrode the lead; and when, some few years hence, these horrid receptacles burst, the fumes emitted will destroy those who happen at the moment to be in their immediate vicinity, and will diffuse through our metropolitan atmosphere, the elements of a pestilence probably more virulent than that from which we are just emerging."

"We have really only two practical alternatives as to the disposal of the resulting gases—they must either be burned or breathed."

From the above extracts it will be seen that the following assertions are brought forward:—

1. That among the products of decompo-

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sition are cyanogen, hydrocyanic acid, sulphuretted, carburetted, and phosphuretted hydrogen gases.

2. That all leaden coffins become bulged by the expansion of the elastic fluids within.

3. That the gases are pent up until the coffin becomes so corroded by them as to be unable any longer to confine them.

4. That the coffin then suddenly bursts, and the gases escaping, are capable of destroying all within reach.

5. That these effects take place within ten years.

6. That the putrefaction of a corpse is not retarded by its being placed in an air-tight leaden coffin.

7. That the gases should be burned to destroy them.

Some of these allegations were so consonant with theory and common report, that one of the most eminent chemists in Europe, with whom I communicated on the subject, said that he "was not prepared to deny any one of them." He added, however, that he believed all the deductions were merely theoretical, as he knew of no experiments that had been made on the subject.

I therefore determined, with the sanction and approbation of the Board of Health, to ascertain, by actual experiment, every particular of the process of decomposition as effected in leaden and wooden coffins in vaults and catacombs, as well as for the purpose of keeping a record of the state, condition and contents of these subterranean receptacles.

I have now carefully inspected between fifty and sixty vaults of the principal churches in London, and have examined the external condition and appearance of more than 22,000 coffins. I have also examined the state of the contents of nearly a hundred. The results of these investigations are so different from what could have been anticipated, and from what was generally believed to be the case, that I think it important to lay them before the profession, previous to the practice of interment in vaults becoming a matter of history.

I may add that I have not relied alone on my own researches, but have taken the evidence of all the clergy, churchwardens, sextons and undertakers of every parish in which I could possibly obtain it. The following are some of the conclusions I have come to from these varied sources of information. It will be seen that they are all in direct contradiction to the allegations contained in the *Times*.

1. I have never succeeded in obtaining any traces of the presence of cyanogen, hydrocyanic acid, sulphuretted, phosphuretted or carburetted hydrogen gases, even in the smallest quantity. In several instances I analysed the air of the vaults themselves, and in one only, namely, in that of St. Mary-le-Strand, was there any indication of the presence of any of these. This was sulphuretted hydrogen in a very minute proportion, and there was no certainty whatever of this being derived from the decomposing bodies, which are here only thirty-two in number. I examined gases formed by bodies of persons of all ages, from the still-born infant to those who had survived to the age of ninety-two. The coffins had been in the vaults various lengths of time: those that had been there a week were examined, as well as those that had remained there a century and a half. Death had been caused by accident, by age, by disease. The latter had been of the most varied kinds—typhus, phthisis, small-pox, childbirth, dropsy and cholera.

Not one of the above circumstances seemed to influence, in the slightest degree, the composition or character of the gases. These were most remarkably similar in every instance. *All the gases I analysed or otherwise examined were composed of nitrogen and carbonic acid gas, mixed with atmospheric air, and holding decaying animal matter in suspension.* There was but one ingredient that was sometimes present, sometimes entirely absent: this was ammoniacal gas, which was sometimes present in very large quantities. When this was added to the other gases, it overcame all other odor; when it was absent, the smell much resembled that of very putrid moist cheese. In every instance I searched most carefully for the presence of the hydrogenous gases mentioned, but never found the slightest trace of any one of them.

Another proof, if any were wanting, of the absence of sulphur in any considerable quantity as a product of decomposition, is, that although the metal of many of the older coffins had been acted upon, the substance thus formed was always a carbonate, never a sulphuret or sulphate of lead.

2. *All coffins do not become bulged* by the expansion of the elastic fluids within. On the contrary, so rarely is this the case, that it is the exception instead of the rule. In many vaults there was no instance of a coffin that had bulged, or, as the undertakers say, "blown." In 22,000 I could not find 20 that were or had been in this condition. This is to be accounted for by the fact that lead is so porous a metal that it allows the exosmose or transudation of the gases with great facility, more especially

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when there is pressure within. It is well known that even the iron gas pipes so thickly underlying our pavements cannot be made retentive of the gas.

3. The gases, therefore, are but very rarely pent up; the instances of "blown" coffins not averaging one in a thousand.

4. *The coffin does not suddenly burst, and the escaping gases do not destroy all within reach.* From the most searching inquiries from coffin-makers, undertakers, and all persons most likely to be well informed on the subject, I have never obtained any sufficient evidence of the sudden rupture of a coffin. It is universally the custom of sextons, when they perceive any leaden coffin to be blown, to send to the undertaker for the purpose of having a hole drilled in the upper part of the lead, so as thus to allow the escape of the foul air. During the operation, the parties employed endeavor to avoid inhaling the gas, and sometimes hold a piece of burning wood or paper at the orifice, so as to destroy in some measure the offensive odor I have described. In my opinion, the fact that coffins so rarely become bulged, is to be ascribed to the great porosity of the metal employed. When slightly bulged, the lead, from being thinner than before, becomes more pervious to the contained air.

The action of the putrefactive gases on the human frame, although not so immediately fatal as the *Times* would have us believe, certainly produces many disagreeable symptoms. In my own person, the most prominent among these were nausea, with vomiting, after continued exposure, succeeded by diarrhœa. These are followed on the succeeding day by a throbbing pain in the upper part of the head, great prostration, and entire loss of appetite, accompanied with an unpleasant earthy taste in the mouth. These symptoms, after being experienced for a long time, were followed by a series of boils, accompanied with much phlegmonous erysipelas, and requiring surgical assistance.

On one occasion, however, I was nearly meeting with an exception that would have corroborated, to a certain extent, the assertion that sudden death may occur from such exposure. I was examining the large vault under the church of St. Andrew's, Holborn, which contains about five thousand coffins, partly of wood, partly of lead. They are placed in eight-arched culs-de-sac running off on either side of the central passage. The air in these compartments is in a state of almost complete stagnation, as there is no ventilation in them. The coffins are piled one above another from ten to thirteen high, and reach to within a short distance of the roof. There is scarcely sufficient room to allow a man to crawl on all fours between the upper coffins and the bricks of the arches. Wishing to see how far these compartments filled with coffins extended, I sent the sexton in with a candle. In a very short time, observing the flame begin to lower, and give very little light, I called to the man to come out immediately. He instantly obeyed, and after much exertion and the extinction of the candle, he presented himself in a pitiable condition, his eyes half starting from their orbits, breathing deeply, and evidently much oppressed. Exposure to a current of fresh air shortly revived him. The air being mixed with a large quantity of carbonic acid gas was the cause of this nearly fatal accident—not the presence of cyanogen or any hydrogenous compound.

5. The complete decomposition of a corpse, and its resolution into its ultimate elements, is by no means accomplished in a period of ten years; nor is that description accurate which represents, that at the end of that period nothing "but a few brittle bones are left in the else vacant shroud." On the contrary, so extremely slow is the process under the circumstances, that I have but rarely seen the remains in a leaden coffin of any age in the condition described. In a *wooden* coffin, the remains are found exactly in this state in a period of from two to five years. This period depends upon the quality of the wood, and the free access of air to the coffin. But in leaden coffins, fifty, sixty, eighty, and even a hundred years, are required to accomplish this. I have opened a coffin, in which the corpse had been placed for nearly a century, and the ammoniacal gas formed dense white fumes, when brought into contact with hydrochloric acid gas, and was so powerful that the head could not remain near it for more than a few seconds at a time.

6. *The putrefaction, therefore, is very much retarded by the corpse being placed in a leaden coffin.*

7. If by this assertion it is only meant that the gases should be passed through flame to destroy the organic particles mixed so largely with them, this can be understood. This difficulty would, however, still remain the same: except in the few exceptions I have mentioned of blown coffins, the gases are so slowly generated, that no force would be exerted from within sufficiently powerful to expel them. But if it is assumed that these gases can be inflamed like coal gas, I must deny the possibility of this.

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I tested the gaseous contents of nearly a hundred coffins, some of which contained a considerable quantity of gas. In no one instance would the gas inflame; on the contrary, *in every instance*, it extinguished the flame. In addition to my own experiments, I made the most minute enquiries of churchwardens, clerks, undertakers and sextons, but I have never met with any person who has actually *seen* coffin-gas inflame. Several have told me that they have *heard* that it does, but they did not know the fact from their own experience. Some of the officials of St. Anne's, Soho, pointed out a coffin to me, which, having some years ago become blown, had been "tapped." They asserted that a long blue flame had been obtained by firing the jet of gas which issued from the aperture. The smell was described as that of sulphuretted hydrogen; but not one of these persons was present at the time. If, therefore, this or any other hydrogenous compound is ever formed as a result of such decomposition, it is an extremely rare exception.

The following are the conclusions I have arrived at from these investigations:—

1. Interment in vaults and catacombs should no longer be permitted. No good object is gained by this practice. The corpses so treated are by this means converted into so many active volcanos, constantly emitting poisonous effluvia into the atmosphere, for an indefinite period.

2. That after a certain interval, during which friends or relatives should have the power of removing any coffin from the vaults to the public cemetries, all these receptacles should be hermetically closed, and future access thereto forbidden.

3. The use of leaden coffins should be entirely discontinued: they only add to the already exorbitant charges of undertakers. Until a very late period they were constantly stolen from the vaults, emptied of their contents, and sold as old lead.

4. If the object of interment is to allow the human body, after it has served its purpose here, to return as speedily as possible to its elements, and to become perfectly inert, it should be placed in a light wooden coffin, from five to eight feet deep, in a suitable pervious soil.—*The Lancet*, August 2, 1851.

ON DIBENZOYLIMIDE A NEW DERIVATIVE OF OIL OF BITTER ALMONDS.

BY JOSHUA H. ROBSON.

Amongst the host of compounds which have been obtained from oil of bitter almonds, few have a higher claim to the attention of chemists than the hydrobenzamide of Laurent, especially since we have become acquainted with the remarkable molecular change, first pointed out by Fownes, of this substance under the influence of potassa, when, as is well known, the neutral hydrobenzamide is converted, without change of composition, into the basic amarine (benzoline). A closer examination of amarine a base of such definite origin, promised to throw much light upon the constitution of the bases containing 2 equivalents of nitrogen, such as furfurine, fucusine, &c.,

It was with this object in view that I began to work on oil of bitter almonds. This substance however, is of so peculiar a composition, the elements therein appear to be arranged in a manner liable to so many changes, that it appears scarcely possible to touch it without producing some new substance. And so it happened, that when endeavoring to prepare the hydrobenzamide, intended to be converted into amarine, I became acquainted with a new reaction which I had to study before prosecuting the original direction of the inquiry.

On passing a current of ammonia into a solution of oil of bitter almonds in alcohol a large quantity of the gas is absorbed. This solution, on standing for some hours deposits a more or less granular compound together with a resinous substance. The granular substance is entirely insoluble in alcohol, by which means it may be purified. It then consists of a white powder, to which I shall return presently. The substance deposited from the alcohol, (which was believed to contain a great deal of hydrobenzamide), was boiled with a strong solution of potassa for some hours, in order to convert the substance into amarine, when it assumed a bright red color, and became quite brittle and resinous. It was then treated with a highly dilute solution of hydrochloric acid, for the purpose of dissolving out the amarine. The salts of this base being remarkably insoluble, it was found necessary to boil it with successive portions of dilute acid, until addition of ammonia to the solution failed to produce a precipitate. Notwithstanding this, the quantity of amarine obtained in my repeated experiments was very small, clearly showing that the substance deposited from the alcohol contained but a trifling quantity of hydrobenzamide. The resinous mass remaining was then treated with boiling alcohol which dissolved a considerable portion, leaving a yellowish powder,—almost entirely insoluble in ether, but more soluble in boiling wood-spirit, being deposited therefrom on cooling, in

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brilliant feathery crystals. This substance, the principal product of the reaction, was found by analysis to have the following composition.

I. 0·1769 grm. of substance gave
0·5177 ,, ,, carbonic acid, and
0·1060 ,, ,, water.
II. 0·1416 ,, ,, substance gave:
0·407 ,, ,, carbonic acid, and
0·0805 ,, ,, water.
III. 0·1811 ,, ,, substance gave:
0 5272 ,, ,, carbonic acid, and
0·1032 ,, ,, water.
IV. 0·6054 ,, ,, substance burnt according to Dumas' method gave:
52·5 c.c. of nitrogen, at 15° C. and 757mm·5 Bar.
V. 0·1755 grm of substance gave:
0·1764 ,, ,, ammonio-chloride of platinum.
VI. 0·1259 ,, ,, substance gave:
0 1250 ,, ,, ammonio-chloride of platinum.

To these numbers correspond the following percentages:

	I.	II.	III.	IV.	V.	VI.
Carbon..	79·81	79·03	79·84	—	—	—
Hydrogen	6·67	6·3	6·33	—	—	—
Nitrogen	—	—	—	6·807	6·33	6·3

The simplest expression agreeing with these results, is the formula

$$C^{28}H^{13}NO^2,$$

which requires the following values:—

		Theory.	Experiment.
28 equivs. of	Carbon	168	79·62	79·56
13 ,, ,,	Hydrogen	13	6·16	6·43
1 ,, ,,	Nitrogen	14	6·60	6·49
2 ,, ,,	Oxygen	16	7·62	
		211	100·00	

The formation of this new compound, (for which, until a definite nomenclature for the substances produced by ammonia is established, I propose the provisional term *Dibenzoylimide*) is very simple. It is due to the action of 1 equivalent of ammonia upon 2 equivalents of oil of bitter almonds, 2 equivalents of water being eliminated.

$$2\,(C^{14}H^6O^2)+N\,H^3=C^{28}\,H^{13}NO^2+2\,HO.$$

The formation of dibenzoylimide, is perfectly analogous to that of imesatine, one of the products of the action of ammonia upon isatine.

$$\underbrace{2(C^{16}H^5NO^4)}_{\text{Isatine.}}+NH^3=\underbrace{C^{32}H^{11}N^3O^6}_{\text{Imesatine.}}+2\,HO$$

It is evident that the hydrocyanic acid, which is present in oil of bitter almonds, has nothing to do with the formation of this compound, which is confirmed, moreover, by the fact that perfectly pure hydride of benzoyl exhibited exactly the same deportment.

Dibenzoylimide dissolves in hot nitric acid, from which it crystallises on cooling; but on boiling it for some hours it no longer does so; on diluting with water, a substance of a bright yellow color is precipitated. This substance dissolves in concentrated sulphuric acid, but without coloring it, and on the addition of water it is again thrown down. An alcoholic solution of ammonia dissolves it with a bright red color. An alcoholic solution of potassa produces the same effect. It dissolves in boiling alcohol, from which it separates on cooling, but not in a crystalline form. The substance has doubtless assimilated the elements of hyponitric acid.

Sulphuric acid dissolves dibenzoylimide with a bright red color; they separate on dilution with water.

Hydrochloric acid, after being boiled with the substance for some hours does not change it.

Aqueous solution of potassa, on being boiled with the substance for some time does not affect it.

Alcoholic solution of potassa, on boiling with it for some days gradually reconverts it into oil of bitter almonds, ammonia being disengaged.

Before concluding the description of dibenzolymide, I must briefly mention some peculiar changes which this substance appears to suffer under the influence of soda-lime. In determining the nitrogen I experienced some difficulty, inasmuch as part of the substance appeared to sublime through the soda-lime employed, without being altered; I accordingly made the analysis No. III. by Dumas' method; but as this process gave but slightly differing results, I returned again to the soda-lime process. In all these analyses, a beautiful yellow crystalline substance sublimed at the mouth of the combustion-tube, which on fusing with potassium, and testing with the salts of iron, was however found to contain no nitrogen. This substance dissolved in concentrated sulphuric acid with a beautiful violet color, which showed at once that it differed from the original compound. To produce this substance. about a gramme of the dibenzoylimide was mixed with soda-lime and distilled; a small quantity of it was again produced, but this time together with a yellow powder which collected in a cooler part of the tube, and which was found to contain nitrogen: the latter dissolved in concentrated sulphuric acid, producing a splendid crimson color. It is very probable that

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this was a mixture of the non-nitrogenised body with the undecomposed original substance. All my attempts to obtain a sufficient quantity of the non-nitrogenised compound in a state of purity failed; I found it to be entirely insoluble in alcohol, wood-spirit, or ether.

In the commencement of this paper a granular substance was mentioned, which was left behind on purifying the crude product of the action of ammonia upon oil of bitter almonds with alcohol. It remains only to state that this substance, both by the study of its physical properties, and by analysis, was found to be identical with a substance lately obtained by Messrs. Laurent and Gerhardt in the treatment of oil of bitter almonds with ammonia.

I. 0·1135 grm. of substance gave:
0·338 ,, ,, carbonic acid, and
0·0568 ,, ,, water.
II. 0·2339 ,, ,, substance gave:
24·00 c.c. of nitrogen. at 12° C. and 760°mm. Bar.

These numbers lead to the following percentage, which I contrast with the theoretical value of the formula:—

$C^{30}H^{12}N^2$.

	Theory.	Experiment.
30 equivs. of Carbon	180	81·8	81·21
12 ,, ,, Hydrogen	12	5·4	5·55
2 ,, ,, Nitrogen	28	12·8	12·20
	220	100·0	98·96

This substance forms by the coalesence of 2 equivalents of oil of bitter almonds and 1 equivalent of cyanide of ammonium, from which 4 equivalents of water are separated:

$2\,C^{14}H^6O^2 + NH^4Cy = C^{30}H^{12}N^2 + 4\,HO$.

By boiling it for a considerable time with hydrochloric acid, it is divided in accordance with its formation, into hydrocyanic acid and oil of bitter almonds, which distil over, ammonia remaining with the hydrcchloric acid. According to Messrs. Laurent and Gerhardt, it is very probable that this substance is identical with the benzhydramide, but imperfectly investigated by the latter chemists, and which still figures in all the chemical manuals.

In conclusion, I beg to tender my sincere thanks to Professor Hofmann, for the valuable assistance which he has afforded me during this investigation.—*Quarterly Jl. of the Chemical Society.*

EXISTENCE OF AMMONIA IN THE AIR.

BY M. J. L. LASSAIGNE.

It is known that several chemists have found traces of ammonia in the air, and that the prssence of this compound has been detected in rain, snow and hail. The experiments performed last year by M. Ville on air collected at 10 metres above the ground of a garden would seem, however, to demonstrate that the air contains little or no ammonia. Although the results announced by this chemist cannot be disputed, it might be supposed that the air on the surface of the earth, which is in more immediate contact with vegetables, might, perhaps, present differences in this respect. It was with the view of verifying this assertion that M. Lassaigne tried the following experiment in the botanical Garden of the School of Alfort, at 1·50m. from the ground, and at a distance from any habitation.

The apparatus employed consisted as follows:—

In a glass tube placed vertically, corked at each end with corks perforated with several holes, was placed a flask with a large mouth, uncorked, and containing a small quantity of pure concentrated hydrochloric acid. This apparatus, held up by means of a support, was left in the garden under cypress trees and thuyas, in order to shelter it from the too great heat of the sun, from the 1st to the 7th of June. It was visited every day, and the internal and external surfaces of the glass tube were carefully examined. Three days after the commencement of the experiment, there was observed, on the external surface of the tube, towards the end opposed to the direction of the wind which had prevailed during the experiment (north-east), a slight whitish, pulverulent deposit, which was detached by rubbing with the finger, and had a sharp taste. Four days after, the apparatus was dismounted and the external part on which this saline deposit was found washed with a small quantity of distilled water. The washing water was divided into two parts; one, tested with nitrate of silver, immediately showed the presence of the combined nitric acid; the other, on the addition of bichloride of platinum, and being left to spontaneous evaporation furnished yellow crystals of ammoniacal bichloride of platinum which cold water did not immediately redissolve.

The remaining portion of the washing liquid was placed in a watch glass, and left to spontaneous evaporation under a large funnel exposed to the direct action of the solar rays. On the bottom of the glass there remained a crystallisation, in transparent, dendritic needles, of hydrochlorate of ammonia, the true form of which was demonstrated by means of a microscope.

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In the apparatus employed for this experiment, it is easy to account for the formation of this salt by the union of the hydrochloric acid gas which is slowly disengaged by the holes in the corks of the glass tube, and which condensed the ammoniacal gas which the continual currents brought in contact with the sides of this vessel. The condensation of the hydrochlorate of ammonia showed itself more abundant towards the lower opening of the tube. In the foregoing experiment, the dryness of the air doubtless favored the appearance of the chemical phenomenon which detects in so simple a manner the presence of small quanitites of ammonia in the purest air, as it exists in the midst of a garden.—*Journal de Pharmacie*, September, 1851.

MEMOIR ON THE COMPOSITION OF RICINOLAMIDE AND THE PRODUCTION OF CAPRYLIC ALCOHOL.

BY M. JULES BOUIS.

CASTOR oil, which was first studied by MM. Bussy and Lecanu, has been made the subject of investigations by a great number of chemists, and yet its study still leaves much to be desired. Researches on this body, commenced in 1845, in the laboratory of M. Dumas, and since then continued in that of M. Peligot, have furnished me with results which the works of MM. Bussy, Tilley, Williamson, Svanberg and Kolmodin, Saülmuller and Playfair do not give. I propose to discuss them in a collected work, adding my own observations.

In making known the formation of margaramide, M. Boullay announced that several oils undergo analogous transformation by the action of ammonia; but he has gone no farther, and I now present to the Academy the various products to which the action of ammonia on castor oil may give rise.

Castor oil, put in contact with ammoniacal alcohol, or simply with liquid ammonia, forms a solid compound which represents the amide of ricinolic acid, and which I call *ricinolamide*. This amide is solid and white, crystallises in papillæ, is fusible at 150° F., insoluble in water, and soluble in alcohol and ether. It burns with a very smoky flame; it is not attacked by potassa without heat; with heat it disengages ammonia when the potassa is very concentrated, and ricinolate of potassa is formed. This amide is decomposed without heat by the acids, ricinolic acid being separated, and an ammoniacal salt corresponding to the acid employed being formed.

Its composition is expressed by the formula:—

$$C^{36}H^{35}NO^{4}.$$

which represents ricinolate of ammonia less the elements of water.

Ricinolic acid, obtained by saponification, is represented by $C^{36}H^{34}O^{6}$; the analysis of the salts of silver and baryta confirms this composition. The presence of this acid has been noticed by Svanberg and Kolmodin in castor oil.

These results, which appear very simple and easily obtained, have occupied me for a long time, and I have several times abandoned these researches in despair of finding anything; this is owing to the formation in the reaction of secondary products, which cannot be avoided, unless we are forewarned of it. When, indeed, the amide is saponified by potassa, it is evident that the action takes place only at the moment when the potassa, losing its water, commences to fuse; a volatile liquid is then disengaged, hydrogen being produced at the same time. The mass being then redissolved in water and precipitated by hydrochloric acid, a mixture of acids floats on the surface, one liquid, and the other solid, which is the sebacic acid discovered by M. Thenard.

The sebacic acid obtained is white, crystallises in bracteæ, and fuses at 260° F. The analyses of this acid agrees with the formula—

$$C^{20}H^{18}O^{8}.$$

assigned to it by MM. Dumas and Peligot.

Ricinolic acid and sebacic acid being always found associated in this reaction, it was important to ascertain whether these two acids formed part of the amide, or whether the sebacic acid was produced at the expence of the other.

I ascertained that sebacic acid is a product of the decomposition of ricinolic acid, and this is proved by a direct experiment. Indeed, in distilling ricinolic acid or ricinolate of potassa over very concentrated potassa, sebate of potassa is formed, besides hydrogen and the volatile oil of which I shall speak further on.

Hitherto sebacic acid has been prepared by the distillation of oleïc acid or of certain fatty bodies containing oleïne. This operation, the odor of which is very repulsive, has the additional disadvantage of giving only very minute quantities of sebacic acid. Its preparation by means of ricinolamide would require too much time, the amide requiring two or three months to be properly formed. I then tried to obtain it directly by treating castor oil with very concentrated potassa, and the experiment succeeded perfectly.

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In this process, the disagreeable odor of the fatty bodies in decomposition is replaced by the sweet and aromatic odor of the volatile oil which is formed. This easy production of sebacic acid will enable chemists to complete the history of this body, which promises to furnish interesting results, as I have been enabled to prove with M. Carlet, who has assisted me in my researches. We propose to make a detailed study of it and to communicate the results to the Academy if they appear to us worthy of its approbation.

In an industrial point of view, sebacic acid might be susceptible of useful applications, if as I do not doubt, it could be obtained at a low price. Its high melting point and easy combustibility will certainly admit of its being associated with more fusible substances for the manufacture of candles.

The proportion of volatile oil appears to be constant; several experiments performed on different quantities of castor oil from various sources always furnished one-fifth of the weight of volatile oil.

I will now briefly point out the nature of the volatile oil, reserving for a future communication the details which I cannot give now.

It is a transparent, oleaginous liquid, staining paper like the essential oils, insoluble in water, soluble in alcohol, ether and acetic acid. Its odor is aromatic and agreeable. This liquid burns with a very beautiful white flame. Its density is equal to 0·823 at 66° F.; it boils without decomposition at 356° F., under the pressure of 0·760m.

Its composition agrees with the formula—

$$C^{16}H^{18}O^{2}.$$

Its theoretical vapor density is equal to 4·49; experiment gave 4·50=4 vol. of vapor.

Sulphuric acid dissolves the volatile oil, and gives rise to crystalline salts of lime and baryta, soluble in water.

Sulphuric acid converts it, with heat, into a carburet of hydrogen isomeric with carburetted hydrogen gas and amylene. This carburetted hydrogen gas is very fluid, lighter than water, burns with a very beautiful flame and boils without decomposition at 257° F. This carburetted hydrogen is represented by $C^{16}H^{16}$. Its calculated vapor density is equal to 3·86; experiment gives 3·90=4 volumes of vapor.

Fused chloride of zinc produces several isomeric carburets of hydrogen, differing from each other in their state of condensation; but the most abundant and most volatile boils at 257° F., and possesses the same properties as that obtained with sulphuric acid. Its vapor density was found equal to 3·82=4 vol.

Chloride of calcium dissolves in the volatile oil, and furnishes very fine transparent crystals, decomposable by the action of heat, or by the addition of water, into chloride of calcium and volatile oil. The combination is less soluble hot than cold.

The action of nitric acid varies according to its state of concentration; with the dilute acid, I converted all the volatile oil into a volatile liquid acid, but the prolonged action of the acid gave pimelic, lipic, succinic, and butyric acids.

Acetic acid and hydrochloric acid convert the volatile oil into ethers possessing a very aromatic odor of fruit. The ethers are decomposed by potassa, regenerating the volatile oil and forming a salt corresponding to the acid employed.

Quick lime, at a high temperature, decomposes the oil into hydrogen and gaseous hydrocarbons.

Potassa lime or soda lime has no action on the volatile oil at 482° F.; but beyond that there is a disengagement of very pure hydrogen, and a volatile acid which remains combined with the potassa is formed.

All these facts demonstrate, in an evident manner, that the volatile oil should be ranked in the class of alcohols.

The new alcohol is caprylic alcohol, $C^{16}H^{18}O^{2}$, and naturally ranks between amylic alcohol and ethalic alcohol, to form the series.

$C^{2}H^{4}O^{2}$ methylic alcohol,
$C^{4}H^{6}O^{2}$ vinic alcohol,
$C^{10}H^{12}O^{2}$ amylic alcohol,
$C^{16}H^{18}O^{2}$ caprylic alcohol,
$C^{32}H^{34}O^{2}$ ethalic alcohol.

The manner in which caprylic alcohol is formed is easily perceived, and is deduced from the following equation:—

$$C^{36}H^{34}O^{6}+2(KO,HO)=C^{20}H^{16}O^{4}$$

Ricinolic acid. K^{2} Sebate of potassa.

$$+C^{16}H^{18}O^{2}+2H.$$

Caprylic alcohol.

—*Comptes Rendus.*

ON THE EQUIVALENT OF PHOSPHORUS.

BY A. SCHRÖTTER.

(From a letter to Dr. A. W. Hofmann.)

I HAVE already informed you of my being at present engaged in determining the equivalents of phosphorus and of some other elements of the same group; and I have also

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given you a general idea of the method by which I hoped to obtain accurate results. I am now enabled to lay before the Chemical Society the results I have obtained with regard to phosphorus.

Ten combustions of amorphous phosphorus, in perfectly dry oxygen, gave for one part of phosphorus, the quantities of phosphoric acid stated in the second column of the following table. The third column contains the equivalent of phosphorus calculated from each determination:

1.	2·28909	31·0290
2.	2·28783	31·0600
3.	2·29300	30·9358
4.	2·28831	31·0484
5.	2·29040	30·9981
6.	2·28788	31·0588
7.	2·28848	31·0443
8.	2·28856	31·0424
9.	2·28959	31·0183
10.	2·28872	31·0386

The mean of these experiments gives for one part of phosphorus 2·289186 of phosphoric acid, corresponding to the equivalent 31·0274.

The amorphous phosphorus employed for these experiments was perfectly pure, and was used in fragments, and not in powder; the fragments having been exposed for some time to a temperature of 150°, in some cases in carbonic acid gas, in others in hydrogen. The combustion-tube being fixed between two series of drying-tubes, one of which stood in connection with two gas-holders, the other with the atmosphere, the combustion could be so regulated that not the slightest loss was incurred. A tube filled with anhydrous phosphoric acid inserted in place of the combustion tube, showed not the slightest increase in weight after a current of air had been drawn through the apparatus for some time. The entire removal of the oxygen remaining after the combustions was effected by passing a current of atmospheric air from the second gas-holder. A correction for the weight of the air in the tube was not necessary, since all the numbers in the table are differential numbers, and consequently only a slight error would be introduced into the results by the variation of temperature and pressure during the progress of the experiments. In order to remove every trace of a lower oxide, the phosphoric acid was sublimed in an atmosphere of oxygen.

The close approximation existing between the numbers obtained, is the clearest proof that all causes of error were reduced to a minimum. If it be also remembered that an error of 1 milligramme in the denominator of the fraction by which the equivalent is obtained, gives rise to a corresponding error of 0·0187 in the equivalent, the true equivalent of phosphorus may be taken at 31. In fact, all the sources of error in the experiments tend to diminish the quantity of oxygen consumed (which quantity is made the denominator of the fraction above alluded to), and therefore to render the equivalent somewhat too high. The mere circumstance, that in all the experiments a little phosphorus may have fused into the glass etched by the phosphoric acid, and thus have escaped combustion, suffices to explain the small excess obtained.

From this it is evident that the number 31·60, given by Berzelius, approaches nearer to the true equivalent of phosphorus than that found at a later period by Pelouze, namely 32.

Further details you will find in the paper which will appear in the second part of the third volume of the "Denkschriften der K. Academie."—*Quarterly Journal of the Chemical Society.*

ON THE MINERAL WATERS OF BADEN-BADEN.

BY DR. SHERIDAN MUSPRATT, F.R.S.E, &c. PROFESSOR OF THE COLLEGE OF CHEMISTRY, LIVERPOOL.

BADEN is embosomed among hills, forming an offset of the Black Forest range, and seated on the banks of the Oos, an insignificant stream, which once, however formed the boundary line between the Franks and Alemanni. It is famous for its beauty, but more so for its mineral springs, the most renowned in Germany, which were known to, and apppreciated by the Romans, who fixed a colony in Baden, and called it *Civitas Aurelia Aquensis.* These springs are very much frequented, and their water is used internally and externally in all kinds of diseases, more especially for liver, mesenterick, and uterine complaints or obstructions: in fact, in 1845, nearly 40,000 persons resorted to them. The undoubted benefit derived from mineral waters in various diseases, attracted the attention of Chemists from a very early date, to the composition of medicinal springs. A great number, of analyses has been made of such waters, but most of them are imperfect, owing to the crude state of analytical chemistry when they were performed.

As yet, our speculations, regarding the part played by each constituent of mineral waters, are very vague, often in consequence of want of system in the arrangement of the various elements. So long as results are

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not tabulated according to some rule, it is impossible for the physician to institute a correct comparison, or to be able to judge upon which ingredient their effect mainly depends. There are thirteen thermal springs in Baden, which gush out of the rock at the foot of the Schneckengarten. A fine temple-like structure is erected over the Ursprung —principal spring— one of the hottest and most copious sources. The massive vault which encloses the spring is of Roman construction.

It is strange that there is no English work wherein an analysis of the waters of Baden-Baden is given. In order to have this deficiency remedied, I think it proper to furnish your Society with the analysis, which may prove interesting to others further pursuing the subject.

Qualitative Analysis of the Water.— The water as it flows from the Ursprung— principal spring—has a temperature of 67·5° C=15·35°F., the temperature of the surrounding air being 75° F.; it is clear, and possesses a very faint animal odor, a trace of sulphide of hydrogen (?) and does not affect vegetal color: it has a slight saline or more properly speaking a brothy taste.

The annexed experiments showed the several ingredients of the mineral water. When the water was boiled for some time a small white crystalline precipitate subsided. The qualitative analysis was, therefore, divided into two parts.

1st. The analysis of the crystalline precipitate.

2nd. The analysis of the substance in solution.

1st The precipitate was treated with hydrochloric acid, which dissolved it all with effervesence, proving the presence of earthy carbonates and the absence of *Sulphate of lime.* A portion of the hydrochloric solution treated with sulphocyanide of potassium gave a faint red coloring, indicative of iron. The precipitate did not contain any magnesia.

2nd. *Analysis of the Substances in Solution.*—A portion of the liquid filtered from the crystalline precipitate when evaporated to dryness did not effervesce with hydrochloric acid, proving the absence of alkaline carbonates.

A second portion of the liquid afforded on the addition of nitrate of baryta, a slight white precipitate insoluble in hydrochloric acid, indicating sulphuric acid.

A third portion of the solution gave, with nitrate of silver, a copious white precipitate, easily soluble in ammonia, proving the presence of chlorides and the absence of iodides.

A fourth portion of the liquid was treated with hydrochloric acid, and evaporated to dryness over a naked lamp; on treating the residuary mass with water an insoluble part remained—silicic acid. A fifth portion of the liquid with the chloride of ammonium and oxalate of ammonia, gave a white precipitate of oxalate of lime. The filtrate from the oxalate of lime precipitate was divided into two portions; one gave slight indications of magnesia when treated with ammonia and phosphate of soda; and the other portion when evaporated to dryness, yielded a residue which when treated before the blow-pipe, colored the flame intensely yellow, and gave, after being heated to redness with an alcoholic solution of bichloride of platinum, indications of potassa.

By separating the carbonate of lime and evaporating the filtrate nearly to dryness, cubes of chloride of sodium appeared in company with silky crystals of sulphate of lime formed by double decomposition. If the liquid be evaporated to dryness, the residue on exposure readily deliquesces, showing the presence of chloride of calcium. The substances present, and their respective amounts, in the imperial gallon, are the following.

	Grains per Imperial Gallon.	
Sulphuric acid	3·487 ..	3·493
Chlorine	94·064 ..	9·3991
Silicic acid.....	2·947	
Carbonic acid in combination with calcia.....	6·240	
Protoxide of iron...	0·514	
Sodium	52·152	
Potassium.....	7·182	
Calcium.....	4·000	
Calcia (lime) insoluble.....	7·943	
Magnesia.....	1·749	
Protoxide of iron...	0·842	
Alumina, phosphate of lime, organic matter, &c.....	Mere traces.	
	181·120	
Residue given by direct experiment	181·129	

As the qualitative analysis proved the sulphuric acid not to be in combination with calcia (lime), the above bodies are hereafter tabulated in the exact state in which they exist in the water, thus .—

	Grains in the Imperial Gallon.
Chloride of sodium.....	132·644
Chloride of potassium.....	13·720
Chloride of calcium.....	11·040

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Sulphate of magnesia.....	5·236
Carbonate of calcia (lime) ..	14·184
Silicic acid.....	2·947
Proto-carbonate of iron.....	1·356
Alumina, phosphate of lime, organic matter.....	Mere traces
	181·127
Specific gravity of the water..	=1·00284
Cubic inches of carbonic acid per gallon	4·500

The only analysis I can find of the Baden-Baden water is by Kölreuter*. He gives the amount of each constituent in sixteen ounces of the water. I append his results calculated to the imperial gallon :—

Chloride of sodium.....	160·00
Chloride of magnesium...	2·50
Chloride of calcium	17·50
Sulphate of lime.....	30·00
Carbonate of lime.....	16·60
Silica.....	3·30
Extractive matter.....	0·50
	230·40 (?)

His total amount of ingredients appears to be a great deal too much, moreover, he gives *sulphate of lime* as one of the constituents, and finds no *chloride of potassium*.

From the preceding analysis, it appears the principal ingredient is chloride of sodium, hence it belongs to the class of saline waters.—*Read before the Royal Society of Edinburgh.*

RESEARCHES ON A PECULIAR SACCHARINE MATTER FOUND BY M. BRACONNOT IN THE ACORN.

BY M. DESSAIGNES.

AMONGST the numerous discoveries which organic chemistry owes to this skilful chemist, and, without doubt, not one of the least interesting, is that of the presence of sugar of milk in the acorn. In reality, the small quantity of this sugar on which he was enabled to try his experiments, did not enable him to establish its identity with the sugar of milk which exists in the milk of animals. It is this point, which is not uninteresting in regard to vegetable physiology, which I now endeavor to settle. I have prepared several grammes of this saccharine matter, and from its examination it results that it is a body *sui generis*, very distinct from sugar of milk, and different in composition and characters from all known saccharine bodies; it most nearly resembles mannite and dulcose.

The sugar of the acorn crystallises in very fine prisms, which remain completely transparent, when they are formed by the cooling of a weak alcoholic solution. Heated to 410° F. it loses nothing of its weight; at 455° F. it fuses and emits a vapor which condenses as a slight crystalline sublimate. At this high temperature, a very small quantity of sugar is altered and produces a black matter. The remainder, redissolved in water, crystallises without alteration. With ordinary nitric acid, with the aid of heat, it gives only oxalic acid, without any mixture of mucic acid. Bruised with concentrated sulphuric acid, it dissolves without becoming colored, and forms a copulate acid, whose lime salt does not crystallise. By the mixture of concentrated sulphuric and nitric acids, a nitrous detonating body is produced, having the appearance of a white resin, insoluble in water, soluble with the aid of heat in alcohol but which does not crystallise, and in this respect differs from nitromannite.

The aqueous solution of this sugar may be heated for some time with caustic potassa without being colored and without disengaging the odor of caramel. It dissolves very little lime; it readily dissolves baryta. Mixed with a solution of acetate of copper, it may be boiled for a very long time without reduction of the cupreous salt taking place. When it is heated with sulphate of copper and potassa, at the end of a quarter of an hour, it scarcely precipitates a portion of oxide of copper. It is not precipitated by subacetate of lead, but the addition of ammonia with heat causes an abundant precipitate which does not crystallise on cooling.

The sugar of the acorn, mixed with beer yeast, does not undergo alcoholic fermentation. Moreover, mixed with caseum and water, and left to putrefaction for a month in summer, it produced no lactic acid, and I found the whole of it, as it appeared to me, unaltered.

Two combustions by means of oxide of copper and chlorate of potassa gave :—

	I.	II.	Calculation.	
C	43·60	43·88	C^{12}	43·90
H	7·60	7·47	H^{24}	7·31
			O^{10}	48·79

This is, as is evident, the composition of mannite, less the elements of water. To determine the equivalent of the sugar of the acorn, I dissolved together a quantity of sugar, represented by $C^{12}H^{24}O^{10}$, and 2 equivalents of baryta : by cooling, a great quantity of hydrate of baryta crystallised

* Simons' *Heilquellen Europa's* Berlin, 1839, p. 22.

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The addition of alcohol caused a fresh crystallisation of this hydrate; there remained a slightly colored gummy solution, which did not crystallise, and which, in vacuo, became opaque. Thus dried, this combination contained 29·41 per cent. of baryta, and dried at 302° F. it lost 5·92 of water. These numbers agree well with the formula :—

$C^{12}H^{24}O^{10}$, BaO, 2 Aq.

which gives BaO, 29·56 and Aq. 7·48. The difference in the water between the calculation and the experiment is owing to a small quantity of carbonic acid absorbed by the matter, as I have ascertained.

The sugar of the acorn represents, therefore, a distinct and well-defined chemical species, and, on this account, it ought to have a name; but I leave it to M. Braconnot, its discoverer, to give it one.—*Comptes Rendus*, No. 11, September 15, 1851.

FATTY MATTERS OF THE BLOOD.

BY M. GOBLEY.

Among the constituent elements of the blood, the fatty matters appeared to M. Gobley to require fresh examination. Being led towards this study by his previous researches, he undertook it notwithstanding the difficulty which it presented.

The proportion of fatty matter which the blood contains is very minute, for it scarcely amounts to 3 or 4 in 1000 parts. M. Gobley had, consequently, to procure large quantities of this liquid; MM. Cruveilhier, Rayer and Briquet kindly placed at his disposal as much as his work required.

When the results obtained by different chemists are compared, it is perceived that the greatest contradictions exist as to the nature of the fatty matters of the blood. Thus, the neutral phosphuretted fat, which M. Chevreul noticed in the fibrine, according to Berzelius, is not found in it, but is replaced by fatty acids. The phosphuretted fat which M. Boudet detected in the serum, was not found in it by M. Lecanu, who extracted from this liquid oleïc and margaric acids in the free state.

The results which M. Gobley has obtained add new facts to those already known, and, without destroying the experiments of distinguished chemists, they concur in their works and explain their different results.

The first condition for making the experiments was to operate on perfectly fresh blood, for it is known that this liquid is speedily modified when it is no longer under the vital influence. M. Gobley received the blood on leaving the vein into a flask containing rectified ether, and he added ether until no more fatty matter was separated. The fat thus obtained had a yellowish color, and M. Gobley ascertained that it contained cholesterine, cerebrine and lecithine, with traces of oleïne and margarine. M. Boudet had extracted from the blood only a very small quantity of cholesterine; M. Gobley, in consequence of the enormous proportion of liquid which he employed for his experiments, was enabled to obtain sufficient to recognise that not only its properties, but its composition were those of the cholesterine of the brain, of the yolk of egg and of biliary calculi.

M. Gobley afterwards investigated whether the blood contained margaric and oleïc acid in the free state or combined with soda, that is to say, in the state of soap, as several chemists have thought. From all the experiments which he has made, he is convinced that fatty acids do not exist in the blood, either free or combined with soda. He does not conclude, however, that none can be found, for he has ascertained that putrefaction, in acting on lecithine, might give rise to them, and that they are sometimes formed with extreme rapidity. He has no doubt that to this cause must be attributed those which have been found in the blood.

As to the seroline, a new body discovered in blood some years ago by M. F. Boudet, the experiments to which M. Gobley has subjected it do not permit him to regard it as a proximate principle.

To sum up, M. Gobley thinks that he may conclude from his experiments :—

1. That fatty acids do not exist in the blood either free or combined.

2. That seroline is a complex body whose existence as a proximate principle cannot be admitted.

3. That the composition of the fatty matter of the blood is more simple than is supposed; that it is formed of oleïne, margarine, cholesterine, lecithine and cerebrine.

4. That cholesterine is the only crystallisable substance of the fat of the blood; that it presents the properties and composition of the cholesterine of the yolk of the egg and of biliary calculi.

5. That the phosphuretted matter or lecithine is not crystallisable; that it gives as products of decomposition oleïc, margaric, and phosphoglyceric acids.

6. That the cerebric matter or cerebrine possesses the properties of that found in the yolk of the egg and in the eggs and soft roe of the carp.

7. Finally, that the fatty matter of the blood, under the influence of putrefraction,

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gives with the greatest facility oleic and margaric acids.—*Journal de Chimie Médicale*, October, 1851.

NOTE ON THE EMPLOYMENT OF PERSULPHATE OF IRON AND SUBACETATE OF LEAD AS REAGENTS FOR THE SOLUBLE PRINCIPLES OF GUMS.

BY M. J. L. LASSAIGNE.

It is known that the natural products designated under the name of gums are, as regards certain kinds, complex products in which are found a principle soluble in cold water called *arabine*, and an insoluble principle designated by the name of *cerasine*.

The first of these principles constitutes almost the whole of gums Arabic and Senegal, and the second is associated with the first in the gums of this country and gum tragacanth.

Among the chemical characters proper to the gums formed *entirely* or *partially* to arabine, we again call the attention of chemists to the action of persulphate of iron and tribasic acetate of lead in concentrated solution.

Arabine, dissolved in water, produces with the sulphate of iron, employed in small quantity, a yellowish, transparent, gelatinous precipitate, resembling meat jelly: this reaction is manifested even in adding a small quantity of this metallic salt to dilute gum syrup on a piece of glass; pure sugar syrup forms no precipitate with the same reagent. This result is of so much the more importance, as there exist other principles soluble in water which are, like arabine, precipitated by alcohol and subacetate of lead, but on which the sulphate of iron produces no effect. Thus, by the employment of the first two reagents, arabine dissolved in water may be confounded with dextrine and certain gummy matters abounding in many vegetable products: but the salt of iron demonstrates it in an indubitable manner.

In various experiments which we have recently performed, we have easily detected by this reaction the presence of gum arabic in certain preparations into which it had been introduced, and to decide on its absence from other products stated to contain it, when the sulphate of iron gave a negative result.

In examining the soluble portion of gum tragacanth, which had been regarded as isomeric with arabine, we proved that it was also precipitated from its solution by sulphate of iron and tribasic acetate of lead; but the precipitates have a peculiar character which distinguishes them; both are gelatinous, transparent and colorless, and present the appearance of a not very consistent jelly of isinglass. Now, the precipitate which is obtained by pouring subacetate of lead into the solution of arabine of gum arabic is white, floculent, and opaque, like the curd of milk; whilst that formed in the solution of arabine extracted by cold water from gum tragacanth is transparent and gelatiniform.

Do these two different effects, observed with the arabine of gums arabic and tragacanth, indicate that this proximate principle has not the same composition in these gums? The analyses formerly made by M. Guerin Wary demonstrate the contrary; we are disposed to regard this difference of action in the above-mentioned reactions as depending rather on the nature of the species.

In the examination of syrup containing glucose, whether containing gum arabic or not, the employment of persulphate of iron has been of great assistance in seeking this gum or deciding on its absence in testing by this reagent the portion precipitated by alcohol. The dextrine or gummy portion which is separated by this liquid from the syrups of fecula of commerce is not precipitated from its solution by persulphate of iron, which enables us to recognise the gum which is mixed with it.—*Journal de Chimie Médicale*, October, 1851.

ON CHROMIC ACID AND SESQUIOXIDE OF MANGANESE.

BY A. J. FAIRRIE, ESQ.

When chromate of potassa is added to a solu' le salt of manganese a chocolate-colored precipitate subsides, which, when dried at 212°, has, according to the analyses of Warrington and Reinsch,* the formula 2 Mn O Cr O^3 +2 Aq. Mr. Danson however, in working on the chromates, ascertained that the precipitate produced as above, is not a true chromate of manganese, but a salt composed of chromic acid and sesquioxide of manganese, mixed with a definite quantity of sesquioxide of chromium; for on dissolving the precipitate in dilute nitric acid and adding potassa, the precipitated sesquioxide of manganese gave indications of the presence of sesquioxide of chromium; hence the excess of manganese in Warrington's analysis, the

*Gmelin's Handbuch (Translation), IV. p. 248.

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manganese having been determined by precipitation with potassa.*

With the view of reconciling the discrepancies between these statements, Mr. Fairrie prepared a large quantity of the compound, by mixing chloride of manganese with chromate of potassa, collecting the precipitate on a filter, washing thoroughly and drying at 212°. The chromic acid was determined by boiling the salt repeatedly with potassa, filtering, neutralising with acetic acid, and precipitating by acetate of lead. To determine the sesquioxide of manganese, the salt was fused with nitre and carbonate of potassa, and the fused mass boiled with dilute alcohol to decompose the permanganate, &c. The water was determined in the usual way, and the sesquioxide of chromium by loss.

The following were the results obtained:

	Calculated.	Found.	
3 Mn^2O^3	240	45·71	45·12 45·84
3 CrO^3	153	29·14	28·40
Cr^2O^3	78	14·85	15·66
6 HO	54	10.30	10·82 10·74
	525	100·00	100·00

The salt appears to be formed by the action of 7 equivs. of chromate of potassa on 6 equivs. of chloride of manganese.—*Quarterly Journal of the Chemical Society.*

ON THE DETECTION OF SULPHUR

BY J. W. BAILEY.

Dr. Playfair's beautiful salt, the nitroprusside of soda, is justly reccommended by its discoverer as the most delicate of all tests for alkaline sulphurets.† An application of it which is very obvious, although not alluded to by Dr. Playfair, is to employ it not only as a direct test for alkaline sulphurets, but as an indirect one for sulphur in any of its compounds. Any substance containing sulphur will yield an alkaline sulphuret if heated with carbonate of soda, either with or without the addition of carbonaceous matter, according as adeoxidising action is or is not required. The magnificent purple which is then produced by the addition of the fused mass to a drop of the solution of the nitroprusside will at once prove the presence of sulphur. This reaction is so easily obtained and is so decisive, that the nitroprusside of soda must take its place among the most useful adjuncts to the blowpipe tests. By means of it the presence of sulphur in the smallest particle of coagulated albumen, horn, nails, feathers, mustard seed, &c., which can be conveniently supported on a platinum wire for blowpipe experiment, may be most distinctly shown; and I have repeatedly obtained the characteristic purple tint in operating upon a piece of a single fibre of the human hair *less than an inch in length.*—Silliman's *Journal*, May 1851.

* Chem. Soc. Trans., 1842, p. 31.

† See London, Edinburgh and Dublin Phil. Mag., vol. xxxvi. p. 208.

INTRODUCTION TO THE STUDY OF CHEMISTRY.

NO. IV.

II. CHLORINE. Cl. 36.

This simple substance was discovered by Scheele, in 1774; he called it *dephlogisticated muriatic acid.* It was subsequently called oxymuriatic acid by the French Chemists. The name of *chlorine* (from χλωρος green) from its color was given to it by Sir H. Davy, who was the first to show that it was an elementary substance, and that it did not contain oxygen or muriatic acid as had been supposed.

Chlorine exists in nature in enormous quantity in the state of chloride of sodium, or common salt.

Preparation.—Chlorine is obtained in the large way, by putting a mixture of six parts of peroxide of manganese and eight parts of chloride of sodium into a leaden still, and after carefully closing the aperture by which it is introduced, 13 parts of strong sulphuric acid, or a corresponding quantity of sulphuric acid of the specific gravity 1·600 are added by means of a feeding funnel, and the whole is well mixed with the aid of an agitator. The gas is evolved through the neck of the still and is collected in the way desired for the purposes for which it is destined.

Small quantities of chlorine for laboratory purposes may be prepared by heating over a spirit lamp a mixture of 1 part of black oxide of manganese in coarse powder, and 2 parts of commercial hydrochloric (muriatic) acid in a glass flask to which a bent glass tube is adapted: the gas evolved may be collected in a gas jar or in water, or driven into any solution which it may be desired to subject to its action. The oxygen of the peroxide of manganese combines with the hydrogen of the hydrochloric acid, forming water, half of the chlorine combines with the manganese to form chloride of manganese, and the remaining half is

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evolved as free chlorine. This decomposition will be more clearly understood from the following diagram taken from Professor Brande's Manual of Chemistry.

1 Hypochlorous acid	Cl + O= 35·47+ 8=	43·47
2 Chlorous acid	Cl + 3O= 35·47+ 24=	59·47
3 Perchlorous acid	Cl + 4O= 35·47+ 32=	67·47
4 Chloric acid	Cl + 5O= 35·47+ 40=	75·47
5 Perchloric acid	Cl + 7O= 35·47+ 56=	91·47
6 Chloroso-Chloric acid	Cl^3+13O=106·41+104=	210·41
7 Chloroso-perchloric acid	Cl^3+17O=106·41+136=	242·41

Chlorine may also be very conveniently prepared, without the aid of heat, by the action of hydrochloric acid on chlorate of potassa. The oxygen, which this salt contains in considerable quantity, combines with the hydrogen of hydrochloric acid, forming water, and the chlorine is liberated. The chlorate of potassa, in crystals, is placed in a flask, and the hydrochloric acid is poured in; the chlorate dissolves with effervescence, and chlorine is rapidly evolved.

To obtain chlorine perfectly pure and free from moisture, it is passed through water and then through a tube containing pieces of fused chloride of calcium, a substance which attracts moisture very rapidly.

PROPERTIES.—At the ordinary temperature and pressure, chlorine exists in the gaseous form, and, when quite free from moisture, undergoes no change in a temperature below zero; when it contains moisture, this moisture is deposited at the freezing point of water, in the form of white crystalline plates; heat restores these crystals to the liquid state, with effervescence. These crystalline plates are a compound of water and chlorine, which is called *hydrate of chlorine*. The best method of forming hydrate of chlorine is to introduce into a bottle of the gas a small quantity of water, and to leave it for some days in a dark place at a temperature not exceeding 32° F. Crystals of hydrate of chlorine are then formed, of the specific gravity of about 1·2; the composition of this compound, according to Faraday, is chlorine 27·7 and water 72·3, or 1 equivalent of the former and 10 of the latter.

Chlorine gas is of a greenish yellow color of a very powerful and disagreeable odor, very irritating to the organs of respiration, causing cough and irritation of the lungs, even when largely mixed with atmospheric air. Its specific gravity compared with atmospheric air, according to Gay Lussac and Thenard, is 2·470, and the weight of 100 cubic inches 76·59 grains at the ordinary temperature and atmospheric pressure. Thompson makes the specific gravity 2·5 and the weight of 100 cubic inches 81·975 grains at 32° F. According to Davy, the weight of 100 cubic inches is between 76 and 77 grains. Its specific gravity, hydrogen being taken as unity, is 36. Berzelius regards it as 35·42, and Turner, as 35·84. It is not affected by light when quite dry and pure.

Chlorine is a supporter of combustion, and some bodies burn in it even more readily than in atmospheric air or oxygen. Phosphorus, powdered antimony and arsenic, tin and brass foil, and paper dipped in oil of turpentine gas take fire spontaneously in chlorine. When a lighted taper is plunged in this gas, it burns with less brilliancy, its flame becomes smoky and it is speedily extinguished, Chlorine has a very powerful affinity for hydrogen, and when mixed, without the aid of heat, these two gases gradually combine; when ignited by means of a taper or the electric spark, explosion instantly occurs.

Water absorbs two volumes of chlorine at the temperature of 60° F. This solution of chlorine is of a pale yellow color, its specific gravity in 1·008. Its taste is astringent and disagreeable; it bleaches vegetable colors very effectually, although, without the aid of moisture, the gas possesses this property only in a very slight degree. It is therefore probable that the bleaching power is attributable to the evolution of nascent oxygen arising from the decomposition of the water, and this idea is borne out by the fact that other bodies, which contain oxygen but not chlorine, also possess bleaching properties, such as peroxide of manganese, peroxide of hydrogen and peroxide of chromium (chromic acid). When a solution of chlorine in water is exposed to the action of the sun's rays, the water is decomposed, its oxygen is evolved and its hydrogen combines with the chlorine, forming hydrochloric acid.

Chlorine possesses powerful antiseptic and disinfecting properties, effectually destroying contagious and infectious matter and bad odors. It acts by decomposing these matters, and converting them into innocuous bodies.

Chlorine may readily be recognised by its bleaching property, its odor and color: it produces a white, curdy precipitate in a

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solution of nitrate of silver, which is insoluble in the acids, but soluble in liquid ammonia, and which rapidly turns black by exposure to the rays of the sun.

COMPOUNDS OF CHLORINE AND OXYGEN.

These two simple bodies cannot be combined by their direct reciprocal action, as they have but a feeble mutual affinity; when compounds of chlorine and oxygen are formed, which can be effected under certain circumstances, they may easily be separated.

There are seven compounds of chlorine and oxygen, the composition, preparation and properties of which we shall describe in our next number.

The following is a list of these seven compounds with their constitution and atomic weight. Authors differ as to the atomic weight of chlorine and other bodies: some regard them as entire multiples of the weight of hydrogen; others do not coincide in this opinion. We have given in the following table the atomic weights of chlorine as 35·47, although some hold that it is 36 —the number given at the head of this article, and which, as a "round number," better serves the purpose of rough and mental calculations:—

1 atom Manganese.....	= 28	2 atoms Hydrogen.....	= 2
2 „ Oxygen.....	= 16	2 „ Chlorine.....	= 72
1 atom peroxide of manganese.....	= 44	2 atoms hydrochloric acid ..	= 74

The products of their mutual reactions are:—

1 atom Manganese.....	= 28	2 atoms Hydrogen.....	= 2
1 „ Chlorine	= 36	2 „ Oxygen.....	= 16
1 Chloride of Manganese	= 64	2 „ Water.....	= 18
		1 atom Chlorine	= 36

Which may be reduced to the following equation,—

$$MnO^2+2HCl=MnCl+2HO+Cl$$

II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

RESEARCHES ON THE NUTRITION OF OATS, PARTICULARLY AS REGARDS THE INORGANIC MATTERS WHICH ARE NECESSARY FOR THEIR NUTRITION.

BY THE PRINCE OF SALM HORSTMAR.

(Continued from page 24.)

NO. XXI. POWDER OF CALCINED QUARTZ.

With hydrated oxide of iron, without manganese.

gr.

0·030 silicic acid, 0·020 potassa... } silicate of potassa dissolved in 10 grammes of water.
0·1 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·1 hydrated oxide of iron, free from basic salts.
0·05 nitrate of ammonia dissolved in 10 grammes of water.

In this experiment, rather more than 60 grammes of powdered quartz was taken, because 60 grammes could not absorb all the liquid matters.

Stem 66 centimetres high; seven leaves; the third leaf of a very pale green with yellow stripes; the fourth and following leaves of a very bright green, but very short. On the middle of the fourth leaf was a brownish stain, which made its appearance when the sixth leaf was developed. Similar stains were also manifested on the other leaves; these stains were particulary strong on the base of the seventh leaf, which, at this point, was entirely bent round on itself. The leaves had not the normal rough edges.

In the soil were found a great number of infusoria of a green color, which seemed to have caused a partial conversion of the peroxide of iron into protoxide, thus explaining the action of the hydrated oxide.

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Nine very stunted flowers, without fruit; two lateral shoots.

A similar experiment, made with sugar charcoal, showed, more strongly still, the decomposition of the hydrated oxide of iron; for, in this experiment, the deep green leaves were completely reddened by ferruginous stains, which prevented the formation of the stem and killed the plant.

NO. XXII. POWDER OF CALCINED QUARTZ.

With soda instead of potassa, and with alumina.

gr.
- 0·031 silicic acid, 0·018 soda ..... } silicate of soda dissolved in 8 grammes of water.
- 0·1 carbonate of lime.
- 0·03 phosphate of lime.
- 0·03 sulphate of lime.
- 0·02 carbonate of magnesia.
- 1·0 hydrate of alumina taken in the humid state from the filter, and intimately mixed with the powdered quartz, the whole dried at a gentle heat, and then united with the dry additional substances. One gramme of this moist alumina after desiccation, weighed only 0·03; it was obtained by making ammonia react on nitrate of alumina.
- 0·025 magnetic oxide of iron.
- 0·001 carbonate of protoxide of manganese.
- 0·038 nitrate of ammonia dissolved in 1 gramme of water, mixed with the solution of silicate of soda; the ammonia was in great measure driven off by exposure to a moderate heat; the whole was brought to the bulk of 17 grammes by the addition of water.

Stem 16 centimetres high, languishing; five leaves of a bright green; the fifth leaf striped with a yellowish red; only one flower, without fruit; a trace of a lateral shoot.

NO. XXIII. POWDER OF CRYSTALLISED QUARTZ, CALCINED.

With alumina, without iron.

gr.
- 0·026 silicic acid, 0·013 potassa... } silicate of potassa dissolved in 7 grammes of water and mixed with the solution of alumina and potassa.
- 0·03 of a solution of alumina and potassa, containing 0·0004 of alumina.
- 0·1 carbonate of lime.
- 0·03 phosphate of lime.
- 0·03 sulphate of lime.
- 0·02 carbonate of magnesia.
- 0·038 nitrate of ammonia dissolved in 10 grammes of water.

Stem 46 centimetres high, curved and languishing, six leaves, the first two and last of which were green and the others whitish; the flowers of a green color; 4 flowers, two of which were stunted, without fruit.

The solution of alumina and potassa contained 0·0004gr. of alumina, and as much potassa as was necessary for its saturation.

NO. XXIV. POWDER OF CRYSTALLISED QUARTZ, CALCINED.

With aluminate of potassa, with iron.

The same additional substances as in experiment No. XXIII, to which were added:—

gr.
- 0·06 hydrated oxide of iron.
- 0·001 carbonate of protoxide of manganese.

Stem 56 centimetres long; six green leaves without stains, the fourth and fifth only covered with yellow longitudinal stripes; seven complete flowers; no fruit.

Two green lateral shoots, one of which, after the death of the principal stem, bore five languishing flowers, without fruit.

NO. XXV. POWDER OF CRYSTALS OF QUARTZ, CALCINED.

With aluminate of potassa, iron and manganese.

gr.
- 0·035 silicic acid, 0·018 potassa... } silicate of potassa dissolved in 10 grammes of water and mixed with the solution of aluminate of potassa.
- 0·02 of a solution of aluminate of potassa, containing about 0·0003 of alumina.
- 0·01 carbonate of lime.
- 0·03 phosphate of lime.
- 0·03 sulphate of lime.
- 0·02 carbonate of magnesia.
- 0·025 magnetic oxide of iron.
- 0·001 carbonate of protoxide of manganese.
- 0·028 nitrate of ammonia dissolved in 7 grammes of water.

Stem 43 centimetres high; five perfectly green leaves; three flowers, one fruit; two small lateral shoots.

NO. XXVI. POWDER OF CRYSTALS OF QUARTZ, CALCINED.

With hydrate of alumina, without iron.

gr.
- 0·026 silicic acid, 0·013 potassa... } silicate of potassa dissolved in 10 grammes of water.

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1·5 hydrate of alumina taken moist from the filter, and, in this state, mixed intimately with the powdered quartz; the whole was dried, and mixed with the other substances. The mass contained 0·045 of dry hydrate of alumina.
0·1 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·038 nitrate of ammonia dissolved in 7 grammes of water.

Stem 51 centimetres high, curved, but much more vigorous than the high plants obtained without alumina and iron.

Six yellow leaves, with green stripes; the sheathes separated from the stem.

Six vigorous flowers, but rather yellow than green; no fruit; one lateral shoot.

The alumina contained traces of iron; we hesitated to purify it by means of ferrocyanide of potassium.

NO. XXVII. POWDER OF ROCK CRYSTAL, CALCINED.

With alumina and iron.

gr.
0·035 silicic acid, 0·018 potassa... } silicate of potassa dissolved in 7 grammes of water.
0·1 carbonate of lime.
0·05 dry hydrate of alumina.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·025 magnetic oxide of iron.
0·001 carbonate of protoxide of manganese.
0·038 nitrate of ammonia dissolved in 1 gramme of water, mixed with the solution of silicate of potassa and heated until the ammoniacal odor had disappeared: bulk made up to 17 grammes with water.

Stem 55 centimetres high; five green leaves. The fourth and fifth leaves had yellow stripes; seven normal flowers and three other stunted flowers; two fruits; two lateral shoots.

The two fruits supported the test of germination with some slowness in the development.

NO. XXVIII. POWDER OF QUARTZ, WASHED AND THEN CALCINED.

With argil of Almeroden (containing iron and manganese).

gr.
0·026 silicic acid, 0·013 potassa... } silicate of potassa dissolved in 7 grammes of water.
0·01 carbonate of lime.
0·3 argil of Almeroden, washed, slightly calcined, containing iron and manganese.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·038 nitrate of ammonia dissolved in 8 grammes of water.

Stem 63 centimetres high; six leaves of a deep green; a few yellow longitudinal stripes on the third leaf only.

Eight flowers, five complete fruits; two very small buds of lateral shoots.

The germination of the fruits was complete, even in the fifth, which was small.

The principal grain in the ear was empty, whilst the small grains were complete, which proves that nature knows how to distribute economically that which is given sparingly (relatively to the rest of the nutritive substances) for the normal development of the fruits.

The alumina added contains therefore the *something* necessary for proper fructification, but, doubtless, in too small quantity. This something is probably soda.

NO. XXIX. POWDER OF CRYSTALLISED QUARTZ, CALCINED.

With felspar of Baveno, without the addition of iron.

gr.
0·035 silicic acid, 0·018 potassa... } silicate of potassa dissolved in 7 grammes of water.
0·1 carbonate of lime.
0·29 Baveno felspar, not calcined, in very fine powder.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·04 nitrate of ammonia dissolved in 10 grammes of water.

Stem 43 centimetres high, languishing; the joints remained concealed in the sheathes; six leaves, of which the first two were deep green; the others were very pale, and rather yellow than green; five flowers, without fruits; one lateral shoot.

The plant did not absorb sufficient iron, because the felspar was not disaggregated.

NO. XXX. POWDER OF QUARTZ, CALCINED.

With felspar of Baveno, and oxide of iron.

The same additional substances as in No. XXIX, with the following difference:—

gr.
0·2 Baveno felspar, spread on the bottom of the vessel.

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0·12 hydrated oxide of iron, containing manganese, intimately mixed with the powdered quartz and afterwards *calcined*.

0·05 nitrate of ammonia dissolved in 10 grammes of water.

The third and fourth leaves possessed very little green color, to remedy which, on the appearance of the fifth leaf, a piece of iron wire, 5 centimetres in length, was inserted into the soil; but this means failed to produce a green color in the leaves, although it was very successful in the plants raised in sugar charcoal.

Stem 38 centimetres high: a single joint issued from the sheath of the leaf; six leaves, the third and fourth of which were rather yellow than green, and the fifth and sixth perfectly pale; the sheathes of the three lower leaves detached from the stem.

Four flowers; two complete, but small fruits; two small lateral shoots. The two fruits germinated perfectly.

NO. XXXI. POWDER OF CRYSTALLISED QUARTZ, CALCINED.

With artificial felspar.

gr.

0·035 silicic acid } silicate of potassa
0·018 potassa... } dissolved in 7 grammes of water.

0·1 carbonate of lime.

0·13 *artificial* felspar*, produced by boiling a solution of silicate of potassa with alumina dissolved in a solution of potassa, washing and drying the precipitate.

0·03 phosphate of lime.

0·03 sulphate of lime.

0·02 carbonate of magnesia.

0·025 magnetic oxide of iron.

0·001 carbonate of protoxide of manganese.

0·038 nitrate of ammonia dissolved in 10 grammes of water.

Stem 70 centimeters high, as vigorous as the stems of the plants raised in river sand, and which measured 90 and 100 centimetres of normal height: six leaves of a deep green.

Six flowers; six fruits, only two of which were complete, for these two fruits alone stood the test of germination; two weak lateral shoots and one vigorous shoot, which appeared when the flowers of the stem became yellow. The vigorous shoot bore flowers.

* The expression *artificial felspar* is incorrect, since the compound here obtained contains less silicic acid than felspar; it is employed for the sake of brevity.

NO. XXXII. POWDER OF CRYSTALLISED QUARTZ, CALCINED.

With Iceland Zeolite (Nadelstein or Scolezite).

The same additional matters as in No. XXXI; only, in the place of artificial felspar—

gr.

0·2 of Iceland Zeolite.

0·06 of hydrated oxide of iron, instead of the sesquioxide.

Stem 46 centimetres high; six green leaves with yellow streaks: the edges very even, but too rough towards the point; the sheathes of the two lower leaves detached from the stem.

Zeolite was selected with the view of having a perfectly natural silicate of alumina, and quite free from soda, and because this body is more easily soluble in the acids than felspar.

NO. XXXIII. RIVER SAND, CALCINED.*

gr.

0·017 silicic acid } silicate of potassa
0·009 potassa... } dissolved in 5 grammes of water.

0·1 carbonate of lime.

0·03 phosphate of lime.

0·03 sulphate of lime.

0·02 carbonate of magnesia.

0·02 nitrate of ammonia dissolved in 5 grammes of water, mixed with the solution of silicate of potassa and heated until the ammoniacal odor has almost entirely disappeared.

Stem 72 centimetres high, very vigorous; six leaves of a deep green, with rough edges; nine flowers, eight fruits; no lateral shoots.

NO. XXXIV. RIVER SAND, CALCINED.

The same additional substances as in No. XXXIII, but in addition:—

gr.

0·035 silicic acid } silicate of potassa
0·018 potassa... } dissolved in 5 grammes of water.

0·038 nitrate of ammonia dissolved in 2

* This river sand, as well as that employed in the following experiments, came from a locality of Westphalia, which is rich in granitic detritus. After complete calcination, it is of a pale red color, and contains many small blackish grains, which are not influenced by the magnet. 30 grammes of this sand gave, with hydrochloric acid, 0·06 of hydrated oxide of iron, which contained a little phosphoric acid and manganese. Alumina and lime were also found in the acids which had been used in the operation.

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grammes of water, mixed with the silicate of potassa, heated to drive off the greater part of the ammoniacal odor, and brought, by the addition of water, to the bulk of 17 cubic centimetres, to serve as a counter proof for many of the foregoing experiments.

Stem 61 centimetres high, vigorous; five leaves of a deep green; eight flowers, six fruits; no lateral shoots.

This experiment commenced on the 19th of July; on the 3rd November, the fruit was ripe, whilst experiment No. XXXIII commenced on the 22nd of May, and gave ripe fruit on the 8th August.

NO. XXXV. RIVER SAND, BOILED WITH HYDROCHLORIC ACID, WASHED AND CALCINED.

gr.

0·038 silicic acid, 0·016 potassa... } silicate of potassa dissolved in 7 grammes of water.

0·1 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·038 nitrate of ammonia dissolved in 8 grammes of water.

Stem 76 centimetres high; seven leaves of a deep green, vigorous; eleven flowers, nine complete fruits; two other flowers, without fruits. The plant, when cut down and dried, weighed 9 decigrammes. No lateral shoots.

This experiment was made in duplicate; the second result likewise gave a vigorous stem, with deep green leaves; ten flowers, ten complete fruits, without lateral shoots.

To free the sand from hydrochloric acid, it was washed until the washing waters gave no precipitate of chloride of silver.

We attach peculiar value to this experiment, because it seems to prove that besides the additional substances above indicated, something else is still wanting for obtaining complete fructification, and that the sand employed contains this inorganic something.

After having been treated by hydrochloric acid and by calcination, the sand was colorless; and even the small red grains of felspar and the numerous very fine blackish grains, which contained a little iron, were also decolored.

The plant of the experiment No. XXXV, having been cut, was entirely carbonised under the influence of a gentle heat. The charcoal obtained, burned with very pure spongy platinum, gave, after subtracting the weight of the platinum, 55 milligrammes of ash, which makes 7 per cent. of ashes of the weight of the dried plant. It contained positive traces of iron; its analysis gave—

	gr.
18 per cent. of potassa....	0·010
52·7 of silicic acid.....	0·029

The other constituents of this ash were not determined.

NO. XXXVI. RIVER SAND, CALCINED IN A PECULIAR MANNER.

With chloride of potassium, carbonate of soda, and sesquioxide of iron.

gr.

0·035 silicic acid, 0·018 potassa... } silicate of potassa dissolved in 7 grammes of water.

0·001 carbonate of soda dissolved with the silicate of potassa.
0·1 carbonate of lime.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·025 magnetic oxide of iron, besides the oxide contained in the calcined sand.
0·005 chloride of potassium dissolved with the silicate of potassa.
0·05 nitrate of ammonia dissolved in 10 grammes of water.

After having been left to repose for ten days, the mass was *again stirred and mixed,* after which the seed was placed in it and watered. The river sand was calcined in such a manner that all the hydrated oxide of iron which it contained was not entirely converted into oxide. The operation was performed in such a way that the lower part of the mass contained in the crucible was colored black after the calcination by the magnetic oxide of iron, of which it was desired that the mixture should contain an excess.

Formation of the stem abnormal: leaves of a deep green, with smooth edges; the stem extraordinarily large at the base. The five lower leaves pressed against each other: the fourth and fifth leaves had strong ferruginous stains: the sheathes were detached from the stem. After the appearance of the fifth leaf, although the stem was not completely formed, and before flowering, several lateral shoots were formed, also having smooth edged leaves. It was only when the lateral shoots had attained the same height as the principal stem (14 centimetres), that the latter began to rise.

Principal stem 49 centimetres high; seven leaves, the last of which alone had rough edges. Six completely stunted flowers; no fruit. One of the lateral shoots attained the height of 46 centimetres, with three stunted flowers, without fruit.

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The too powerful action of the iron could not be mistaken; all the peculiar phenomena presented by the plant might be explained by this action, if the following experiment, No. XXXVII, did not rectify such a view.

A similar experiment was performed at the same time with sugar charcoal. The results were identical, with the exception of the ferruginous stains, which did not appear: the plant, moreover, was much less vigorous in proportion.

NO. XXXVII. RIVER SAND, CALCINED. *With chloride of potassium and carbonate of soda, without magnetic oxide of iron.*

The same additional substances as in the foregoing experiment, but without magnetic oxide of iron; the sand was completely calcined, and instead of presenting, as in No. XXXVI, black portions, the mass was of a reddish color throughout.

(To be continued.)

NOTE CONCERNING A NEW PROCESS OF PHOTOGRAPHY ON GLASS. (POSITIVE PROOF.)

BY M. J. R. LEMOYNE.

I HAVE the honor of presenting to the Academy a series of photographic proofs, and a description of the means by which they were produced.

The process in question is completely practical, and not a matter of accident: indeed, about a year ago, I ascertained that clichés on glass may sometimes present the positive aspect, and researches directed towards this object in a short time furnished me with very beautiful specimens; but it is only after a long series of experiments continued to the present time that I have arrived at a sure and constant process.

Most of my experiments had the sole object of obviating the known inconveniences of albuminised plates, and, independently of the positive process, I made considerable progress in the production of clichés by the following modifications, which constitute in reality a new mode of preparation.

1. Purification of the white of egg, by leaving it for a long time to become stale, and even adding sugar to it to cause slight fermentation, which clarifies it much better than the beating up into a snow commonly adopted.

This first addition of sugar ($\frac{1}{2}$ gramme to the white of one egg) does not prevent my afterwards adding to it the quantity already recommended ($2\frac{1}{2}$ to 3 grammes) to obtain greater sensibility to the light, and with the processes which I employ afterwards, the presence of this body increases the adhesion of the layer, instead of diminishing it, which is the common objection to it.

2. Iodisation of the albuminous layer, after dessication, by immersion in a bath of tincture of iodine containing $\frac{1}{10}$ of its bulk of nitric acid of 40 degrees.

This means is very simple, and there result neither streaks nor any of the defects inherent to the employment of albumen containing in solution iodide of potassium. Of all the processes known, only one can enter into comparison with it, and that is, the employment of the vapors of iodine; but the humid way has the advantage here both as regards rapidity of execution and simplicity of apparatus.

3. Suppression of acetic acid and the employment, for rendering the plates sensible, of a simple solution of nitrate of silver of $\frac{1}{10}$.

I do not know whether acetic acid is really necessary on albuminised glass, when gallic acid is employed for causing the appearance of the image; but, with sulphate of iron, it is unquestionably an expensive superfluity; the volatility of this acid is moreover a cause of spontaneous modifications in the solutions, and this is a serious inconvenience.

4. Employment of a second bath of nitrate of silver ($\frac{1}{20}$) after washing the plates with fluoride of potassium as an accelerating substance.

The object of this operation is not only to increase the sensibility, but especially to convert the excess of fluoride of potassium into fluoride of silver and thus to prevent it from acting on the glass and deglutinating the albumen; it is useful, however, but only in the first point of view, whatever accelerating agent may be used.*

5. The substitution of the gallic acid generally employed for causing the image to appear, by a concentrated bath of sulphate of iron *at the temperature* of 194° F.

From this modification results an enormous increase of sensibility; moreover, the elevation of temperature furnishes images of a very light tint, and it is on this that the production of proofs on glass essentially

* The foregoing modifications result in great measure from my first researches concerning the production of clichés on glass; the following two proceed from subsequent experiments, tending especially to the improvement of the positive process on albuminised glass; but advantages have likewise resulted in the first respect.

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depends; finally, the opacity is less than by the other processes, and there results, as regards the reproductions on paper, a softness which does not prevent fineness, and the want of which has hitherto often been urged as an objection to the employment of albuminised glass.

6. Fixation of proofs in four or five minutes, by the complete solution of the iodide of silver, by means of a bath containing a proper quantity of cyanide of potassium and hyposulphite of soda.

This mode of fixation is superior, in all respects, to the bromide of potassium and the hyposulphite of soda generally employed without being mixed. It gives in a very short time and without injuring the proofs, not only a faultless fixation, but also a complete transparency in the unimpressioned parts, and, finally, a considerable increase of the adherence of the whole layer. It may, moreover, easily be applied to all the known processes of photography on glass, and, doubtless, even to operations on paper.

The proofs obtained by this process are formed of opaque images, of a yellowish white, contained in a diaphanous medium, and present, consequently, the positive or negative aspect, according as they are placed on darker or lighter ground.

As negative proofs, they resist better the variations of temperature, are more transparent (which allows of their being reproduced with a feeble light), and, finally, as I have just said, they furnish on paper softer designs than those prepared by other processes.

Covering the albumen side with black paint converts them into positive proofs, when they present a clearness and a fineness comparable to metallic plates, and varied tints, many of which are very artistic.

As regards the time necessary for the action of light, I may add that I have obtained landscapes in the sun in one second (with a demi-plate object glass with combined glasses furnished with a diaphram of $^{m}03$ aperture) and portraits in the shade, out of doors, in four or five seconds, and in a room in from eight to fifteen seconds, (with the same object-glass without the diaphragm). The proofs were, moreover, naturally *rectified;* and therefore, if the metallic plate sometimes presents a slight advantage as to rapidity, it loses it completely when the inversion of the images connot be admitted, and when it requires the employment of redressing apparatus.

Such are, in a practical point of view, the principal ameliorations which I have realised; as to the theoretical tendency of my studies, it would be difficult to present a summary of the same kind, and my notice being very concise in this respect, I will content myself with giving here the principal considerations which are my own, namely:—

1. The object of the accelerating agents and the principles which should guide their selection.

2. The chemical theory of resemblance in all kinds of photography.

3. Solarisation of the proofs on glass and means of preventing it as well as bringing out ill developed images.—*Comptes Rendus.*

COLORED DAGUERREOTYPES--HILLOTYPE—HELIOCHROMY.

It has been announced more than once, that Mr. Hill, of Westkill, New York, had discovered a simple method of making colored daguerreotypes. (See vol. liv., pp. 273, 298, 332.) It is now stated in the *Daguerrean* (American) *Journal*, that one will be exhibited here this month. A great interest has been manifested in the discovery, but hitherto all has been very quiet and secret about the process. It has long been a desideratum with artists to discover such a process. Becquerel, in France, has produced colored pictures, but he was never able to fasten the colors; still many kept working in hopes of discovering this important secret, and before Mr. Hill has seen fit to present the public with any account of his process, M. Niepce St. Victor (nephew of the celebrated discoverer of photography, in France) has made the grand discovery, and showed his pictures to the world. Three of his pictures are now before the public in London, and the new art is called Heliochromy, or sun-coloring. The glory of the discovery will belong to him who first gives it to the world,—a fact not so well appreciated here as in Europe.

The three heliochromes now in London are copies of colored engravings, representing the one a female dancer, the others male figures in fancy costumes; "and every color of the original," says the *Athenæum*, the editor of which has examined them, "is most faithfully impressed on the prepared silver tablet." According to the *Athenæum's* account, which appears to be a hasty one, and is therefore not so precise and minute in the description as could have been wished, "the plate, when prepared, presents evidently a dark brown, or nearly a black surface—and the image

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is *eaten out* in colors. "We have endeavored," it adds, "by close examination, to ascertain something of the laws producing this most remarkable effect; but it is not easy at present to perceive the relations between the colorific action of light and the associated chemical influence." The following is the *Athenæum's* description of the pictures:—

"The female figure," it says, "has a red silk dress, with purple trimming and white lace. The flesh tints, the red, the purple, and the white are well preserved in the copy. One of the male figures is remarkable for the delicacy of its delineation: —here blue, red, white, and pink are perfectly impressed. The third picture is injured in some parts; but it is, from the number of colors which it contains, the most remarkable of all. Red, blue, yellow, green and white are distinctly marked; and the intensity of the yellow is very striking."

What is said here about yellow is the most interesting, as the color has always been understood to be the one with which Mr. Hill has had most difficulty, and which he never has been able to fix on his plates in any brighter hue than that of buff.

Concerning the relative merit and artistic beauty of these new sun pictures, the *Athenæum* does not speak very distinctly; and we are left to infer that they are not altogether of the highest grade of excellence. We are told, however, that "these results are superior to those which were given to the world when photography was first announced; and the *Athenæum* adds, that "we may expect shortly to see the heliochromes presenting favorite scenes and chosen friends to us in all the beauty of native colors."

We have not seen any printed account in our home exchanges giving anything like an idea of St. Victor's process, but happily we can give a skeleton idea of it from recent proceedings of the Paris Academy of Sciences.

It is well known that a plate of silver immersed in a solution of sulphate of copper and the chloride of sodium, and rendered electro-magnetic by means of the battery, becomes susceptible of receiving color, when on withdrawal from the solution, it is exposed to the action of light. Becquerel, by exposing this plate to the colored rays of the solar spectrum obtained an image of the spectrum in such a manner that the red ray produced on the plate an image of a red color, the violet, a violet color; and so with the other rays. The idea struck young St. Victor that there were some relation between the color which a body communicates to a flame, and the color which the light developes on a plate of silver which had been chlorinated, and he therefore commenced a series of experiments to test its correctness. He knew that strontium gave a purple color to alcoholic flame. He therefore prepared a plate of silver by passing it through water saturated with chlorine and the chloride of strontium. He then applied the back of a drawing, containing red and other colors, against the plate, and exposed the whole to the light of the sun for fifteen minutes, when the colors of the picture were produced on the plate, but the red one far better defined than the others. To produce the six other rays of the solar spectrum, the same method used to produce the red color is followed with other substances. The chloride of calcium for an orange, the chlorides of soda or potassium, or pure chlorine, for yellow; and beautiful yellows have been produced by a solution of hydrochloric acid and a salt of copper. The green ray was produced by boric acid and the chloride of nickel; the blue ray was obtained by a double chloride of ammonia and copper, and a white ray with the chloride of of strontium aud sulphate of copper.

A silver plate prepared with water acidulated with hydrochloric acid and the battery, gives all the colors by the action of light, but the ground of the plate is always black. St. Victor found that all the substances which produced colored flames produced colored images by means of light. This is truly an important discovery. Oxygen has nothing to do with the colors, the same results were produced in vacuo; but water was necessary to the process, as dry chlorine produced no effect. The plate to produce these effects upon must be prepared with metallic silver, and that very pure. The baths are made of one-fourth by weight of chloride and three-fourths of water. After the plate is well polished by tripoli and ammonia, it is immersed in the bath at one stroke and allowed to remain for some minutes. It is then removed from the bath, rinsed in clear water and held over a spirit lamp till the plate becomes a cherry color, at which point it is exposed to the light in the camera. It takes about two hours of exposure, but the process will yet be shortened. It has been exceedingly difficult to fix the proofs, and the process for this has not been made public.

The whole process to be successful must

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be nicely managed. The idea about the relation between the substances producing colored flame and colors on the silver plate is a very important addition to the treasury of science.—*Scientific American.*

PHOTOGRAPHY ON COLLODION AND ON ALBUMEN.

To the Editors of the Chemist.

GENTLEMEN,—Having given particular attention to photography on collodion and albumen, I shall not only endeavor to show, (in the hope that you will deem this communication worthy of insertion) the position in which they both stand relative to the above-named art, but also a means of operating to a certainty with albumen, a condition, I believe, never before attained.

What, in my opinion, constitutes a perfect medium for receiving impressions on glass, must possess two essential properties, namely, that of giving a film of both smoothness and transparency, and also of being capable of receiving to a proper degree of intensity the impression given. Now collodion, unless extremely diluted, will not give a layer possessing uniformity on a large scale: and if sufficiently limpid for that purpose, then is the layer thus produced too thin for receiving that intensity of shade that ought to exist. Thus the reason that most of the positive proofs from collodion negatives we see, have not those parts that ought to be purely white in that degree of perfection which the object had from which they were taken, and which, consequently, they were meant to represent, the evident reason and evil being, the admission of light through those parts that ought to be entirely opaque.

These evils, I think, will be difficult to remedy; besides, seeing no advantage in the use of collodion over albumen, except that of drying quickly, I perceive in many cases a positive defect, for were it not so, we might then obtain larger layers and of greater consistency, a thing extremely desirable. I also find from my own experience, that albumen treated with pyrogallic acid after the same manner as collodion, is even more sensitive than the latter.

All who have seen must admire the positive proofs from albumen negatives, which are perfect in every respect, having none of those defects consequent on the use of collodion; but from the uncertainty there has been up to this moment in obtaining good results, as a natural consequence something is sought, for instance collodion, on which greater dependance can be placed, the imperfections consequent on the use of which are put up with, rather than fail altogether in producing results. I therefore, now offer to all lovers of photography, a means of operating to a certainty with albumen.

Having found that no dependance could be placed on albumen for producing a uniform layer with iodide of potassium dissolved in it, owing to small coagulated particles being produced by the presence of the salt, I have been able to adopt a different and extremely simple mode of operating.

Hazing beaten the white of an egg into a froth and suffered it to resume its liquid state, I pour it into a one or two-ounce measure with a lip (this is essential); I then run it from the measure on the glass required, allowing it to flow equally in all directions, returning it after by one of its corners; then the side the most downward I place between the lip, moving it slowly backwards and forwards until no more accumulation of fluid takes place: this is also essential, Then the glass being placed in an upright position with the same side downwards, I suffer it to dry, or, if speed be required, I use the aid of the fire. Then having placed in a shallow dish equal parts of spirit of wine and water, I gradually let the albuminized side of the glass fall in after the usual method: this not only coagulates it immediately, but likewise gives to it extreme toughness. It must then be washed and sized; great attention must be paid to this, for, if not, when the second solution is applied, it will blister. I then plunge it into spirit of wine, without water, having dissolved therein by the aid of iodide of potassium 5 grains of iodide of silver to the ounce; after which it is then washed (drying is not now necessary), and, although no perceptible change has taken place, still, when placed in a solution of nitrate of silver, 20 grains to the ounce, the yellow iodide appears and is at once ready for the camera. The rest of this operation, such as developing, &c., is the same as generally employed.

I may as well here remark, that when gallic acid is employed, only half the usual amount of acetic acid need only be used.

Hoping that this little communication may eventually lead to more important results,

I am, Gentlemen,
Yours respectfully,
J. PERRY.

2, Beech Street, Barbican,
City, October 14th, 1851.

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RED AND GREEN FIRES.

BY DR. BÖTTGER.

THE mixture for *red fire* recommended by Dr. B. is 40 parts of nitrate of strontia, 13 parts of sulphur, 2 parts of lime free charcoal, with which are mixed, with a horn spatula, in order to avoid explosion, 5 parts of perfectly dry chlorate of potassa. For *green fire*, 12 parts of dry nitrate of baryta, 4 parts sulphur and 5 parts of chlorate of potassa are mixed with the same precaution.—*Kunst-und Gewerbe-Blatt. für Baiern*, 1851, p. 144.

ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENLLY ENROLLED.*

Improvements in dyeing and cleansing piece goods. JOSEPH RICHARDSON, of Halifax, dyer. Patent dated March 31, 1851.

The patentee describes and claims:—

1. A method of subjecting woollen and worsted piece goods, or piece goods containing woollen or worsted, to the action of the liquors in the dye vat, by causing the goods, when sewn together in a continuous length, to pass over and under a series of rollers submerged in the liquors, alternately in opposite directions, until sufficiently saturated.

2. An arrangement of apparatus, on the same principle as the above, for cleansing piece goods. The cleansing trough is divided into three compartments containing water, and the dyed cloth is passed through each of them in succession over and under a series of rollers, and is then conducted through a pair of pressing-rollers for removing the superfluous moisture to the folding apparatus which is of the ordinary construction.

Improvements in treating mangelwurzel, and in making drinks and other preparations therefrom. THOMAS HUCKVALE, of Choice Hill, Oxford. Patent dated April 2, 1851.

1. The patentee takes mangelwurzel, washes it clean, and cuts it into small pieces of about the size of beans or peas, which are dried roasted and ground in the same manner as coffee, for which the product thus obtained may be employed as a substitute, or with which it may be combined as desired.

2. The leaves of the mangelwurzel are cut into shreds or strips dried slightly charred on a hot plate, and may then be used in the production of a beverage in the same manner as tea is now ordinarily employed.

3. The roots of mangelwurzel after being cleaned are cut into pieces, thrown into vats, and allowed to heat and ferment for two or three days when the temperature is about 70°, when water is added and a fermented liquor obtained similar to cyder or perry.

4. The roots of mangelwurzel after having been washed and cut into small pieces, are slightly charred in suitable kilns or ovens, such as employed in the manufacture of malt, and may then be employed in the preparation of wort, which may be applied to any of the purposes for which wort made from malt or other substance is ordinarily used.

Claim.—The four several modes of treating mangelwurzel and making drinks to the preparations therefrom.

Improvements in the manufacture of carbonates and oxides of barytes and strontia, sulphur, or sulphuric acid from the sulphates of barytes and strontia, and for consequent improvements in the manufacture of carbonates and oxides of soda and potassa. HERBERT TAYLOR, of Cross Street, Finsbury, merchant. Patent dated March 15, 1851.

1. To produce the carbonates of barytes and strontia, and sulphur or sulphuric acid, according to this invention, sulphate of barytes or strontia is reduced to the condition of a sulphuret by calcination in a suitable vessel or furnace, when mixed with the requisite quantity of carbon or carbonaceous substance, or by exposure to an incandescent current of carbonic oxide. The sulphuret, in conjunction with water, or, what is still better, entirely dissolved, and decanted from any remaining insoluble matters, is placed into suitable close vessels, and a current of carbonic acid gas, generated by any suitable process is made to pass into the liquid. A carbonate of the base of the sulphuret employed precipitates, and sulphuretted hydrogen is evolved, which on being conducted through appropriate apparatus, is either ignited in contact with just sufficient atmospheric air to convert its hydrogen into water (proper precautions being taken to prevent explosion), or the sulphuretted hydrogen is brought into contact with nitrous acid vapors and an excess of atmospheric air. Whichever of these methods be adopted sulphur will be set free, and deposited by conducting the gases or vapors through suitably-arranged chambers. When it is desired to obtain sulphuric acid, the sulphu-

* Collected from *The Mechanics' Magazine.*

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retted hydrogen is ignited in an excess of atmospheric air, and is thus converted to sulphurous acid vapors, which are then conducted into apparatus such as usually employed in the manufacture of sulphuric acid, and treated therein in the manner ordinarily adopted in such cases. When the decomposition is completed (which is indicated by the evolution of sulphuretted hydrogen gas ceasing, or by testing the liquid in the decomposing vessel with lead paper, which should not change color), the liquid is drawn off, and the carbonate withdrawn.

To obtain the oxides of barytes and strontia, the carbonates of these bases are subjected to intense heat in a suitable furnace until the entire evolution of their carbonic acid takes place, which will be materially assisted by the injection of steam; by which a hydrated oxide will be produced. Or if when making the solution of the sulphuret of strontia or barytes, the same be in a boiling state and highly concentrated, and then allowed to cool, almost half of the base will be crystallised in the form of hydrated oxide, and a hydrosulphated sulphuret will remain in solution; this, on being evaporated in close vessels after a separation from the crystals, will part with its sulphuretted hydrogen, and a small portion of sulphur will be sublimed. The escaping gas (the watery vapor being first condensed) can be treated and converted into sulphuric acid, as before mentioned. A simple sulphuret of the base employed will remain in the vessel, which on being re-dissolved may be passed repeatedly through the same process as above until the whole of the oxide and sulphate of the base have been obtained; the hydrated crystals can then be purified from the portion of sulphuret adhering to them by washing or re-crystallisation, and can then, if thought proper, be converted to carbonate by exposure, in a moist state, to carbonic acid, or by passing a current of that gas into a solution made of the crystals in water.

To produce carbonate of soda or potassa the sulphates of these bases in solution at the ordinary temperature, are brought into contact with the carbonate of barytes, when mutual decomposition takes place, which is greatly accelerated and perfected by passing a current of carbonic acid into the mixture. By this process, sulphate of barytes is formed and carbonate of soda and potassa remain in solution, and may be obtained by crystallization, or by evaporating the solution to dryness. To obtain hydrated oxides, or caustic soda, or potassa, the oxides of barytes or strontia (the latter being much more readily reducible from the carbonate, is preferable) are slacked with water into a thin paste, to which a proportionate solution of sulphate of soda or potassa is added, when sulphate of barytes or strontia precipitates, and the caustic soda or potassa remains in solution, and may be decanted and used in that state, or evaporated to dryness, and converted to a hydrated oxide by melting it at a lowered temperature. The carbonate of strontia may be also used to decompose the sulphate of soda or potassa, in conjunction with carbonic acid; but this material is very inferior to baryta for the purpose, as, without the aid of carbonic acid, no decomposing effect would be produced.

Claims.—1. The combined process of manufacturing sulphur or sulphuric acid, carbonates of barytes and strontia, and their oxides, from the sulphates of these bases, by the before-described methods.

2 The making of carbonates of strontia and barytes and their oxides from the sulphates of these bases by the methods described.

3. The producing of sulphur or sulphuric acid from sulphates of barytes or strontia by the method above mentioned.

4· The manufacture or improvement in the process of producing carbonate of soda and potassa, by treating or decomposing the sulphates of these bases by the carbonates of barytes or strontia, employing in aid thereof a current or sufficient quantity of carbonic acid, as described; the use of carbonic acid being optional with baryta, but imperative with strontia.

The patentee does not claim the production of the oxides of barytes or strontia by the calcination of the carbonates of these bases, when the carbonates are produced or obtained in any other than the method or manner before described.

Improvements in the rolling and laminating of metals, and in the manufacture of metallic cases and coverings. ALEXANDER ROBERTSON, of Holloway, engineer, and JAMES GLOVER, of the same placa. Patent dated March 20, 1851.

The object of the improvements specified under the first head of this invention is to produce as may be required a uniform elastic pressure, or a uniform dead pressure on both ends of the rolls employed for rolling and laminating metals. For this purpose a crosshead of the same length as the rolls and capable of sliding up and down immediately over them, is mounted in the same frame, and to each end of this crosshead is attached by keys a rod or plunger, which

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bears against the brasses fixed at the end of the rolls. The centre of the crosshead is hollowed out of a cylindrical form, and a coiled spring is inserted and inclosed by a plain disc of metal. A nut is tapped through the centre of the bridge piece at the top of the frame, in which works a screw turned by a hand-wheel, and bearing upon the disc over the spring in the centre of the cross head. By turning the hand-wheel, the screw may be lowered, and the crosshead and rods attached thereto caused to descend and act on the rolls so as to produce a uniform elastic pressure at both ends, which may be increased to any desired extent by lowering the screw. When a dead pressure is required the spring in the crosshead is dispensed with, and the screw made to act against a solid abutment. Another method of producing an elastic pressure on the rolls is by the application of hydraulic power, and in this case the cylinder in the crosshead is to be connected with a force-pump, and the pressure produced in the ordinary manner.

The second part of the invention has relation to a method of making boxes cases, or coverings from William Betts' patent metal, or from tinfoil, or Betts' patent metal pasted orglued on paper and variously ornamented. The method of making boxes or coverings from Betts' metal is as follows:—The patentees take a slightly tapering block of iron of any desired form, and wrap round it a sheet of metal of about the 300th part of an inch thick, and of such a size that the edges just overlap; a small portion also must be allowed to project over the smallest end of the block; they then run a slightly-heated soldering bit or iron along the overlapping edge (using a copper straight-edge as a guide), so as to cause the two parts to adhere. They then fold in the projecting part of the sheet of metal over the small end of the block, place upon it a piece of slightly less size than the end of the block, and run a solderihg-bit along the edges of that piece, and thus finish the covering, which is then to be drawn off from the block. The use of solder is thus entirely dispensed with. In order to prepare tinfoil or Betts' metal for use, it is glued or pasted to paper, passed through a pair of flatting rollers, and then embossed or ornamented with transparent colors, mixed in turpentine or copal varnish; or it is coated with varnish, and then ornamented by sprinkling it with flock. The metal paper, thus prepared may be used for paper-hangings and various other purposes, as well as for the manufacture of boxes, cases, or coverings.

Claims.—1. The producing a uniform elastic pressure on each end of the rolls in the rolling and laminating of metal.

2. The producing a uniform dead pressure on each end of the rolls in the rolling and laminating of metals, by means of the arrangements described.

3. The manufacture of William Betts's patent metal in the manner described,

4. The manufacture of metallic coverings made wholly or partly of tinfoil, or of William Betts's patent metal, pasted or glued on paper. and embossed, painted, or otherwise ornamented as described.

Improvements in preparing, retting (otherwise called 'rotting'), and fermenting flax, line, grasses, and other fibrous vegetable substances. DAVID FARRAR BOWER, of Hunslet, York, manufacturing chemist. Patent dated March 24, 1851.

(*Specification.*)—My invention of certain improvements in preparing, retting, otherwise called rotting, and fermenting flax, line, grasses and other fibrous vegetable substances, relates to certain means whereby the time required for effecting the operation will be considerably reduced, and the fibre of the rough plant will be less subject to deterioation than when submitted to the ordinary rating process. It is well known that after flax has been pulled and dried in the field and the seeds removed therefrom, it is usually steeped for some weeks in water in order to detach the glutinous and other foreign matters contained in the plant; the stalks after being allowed to remain some weeks in the water are removed therefrom and when dried are subjected to breaking, and scutching to remove the woody matters from the useful fibre. I find, however, that the glutinous and other matters, although they may be partially detached by the water, are not wholly removed from the fibre, but when the latter is dried a portion of the glutinous and other matters still adhere to the same and render it unfit for the breaking and scutching operation. According to this part of my invention which has reference to the retting process now in common use, I steep the flax or other fibrous substances in the ordinary way, either in cold or warm water; if cold water is used, the flax must remain immersed for six days, but a much shorter time will answer if warm water is employed. I then remove the flax from the water, and pass it between rollers for the purpose of expressing the glutinous matters from the interior of the plant. After this, I again steep the flax in cold or warm water for another six days, and a

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second time submit it to the squeezing operation by passing the stalks between rollers; after which the flax is dried, broken, and scutched in the ordinary manner, and will be found to be much clearer of the glutinous and other foreign matters than if merely steeped for a much longer time, and operated upon in the ordinary way. For the finer descriptions of flax, and when a good colored fibre is required, I steep the plant in a solution of caustic ammonia, or the neutral salt of one of the alkalies. The salts I prefer to employ are chloride of sodium (common salt) or sulphate of soda. The quantity of the alkali or salt required to be dissolved in a given portion of water will depend upon the temperature at which the process is to be carried on and the quality of the water employed; in other words, the quantity of alkali or salt required will depend upon whether the impurities consist of the salts of iron, or of lime, or other matters contained in the water. It is, however, impossible to give definite proportions for every case; I shall therefore merely say that if common rain-water is employed, I add one pound of caustic ammonia, or one pound of any of the neutral salts to every 150 gallons of water, and with this solution the process may be carried on at any temperature from 90° to 120° of Fahrenheit's thermometer, and the operation will be completed in about thirty hours. If, however, cold water is employed, the quantity of the alkali or salt must be somewhat increased, and the operation will be completed in about four days. The admixture of the above-named chemical ingredients with the water in which the plant is steeped will very much facilitate the retting process; but if, in addition, the fibres after being submitted to the action of the alkaline solution for a time, are passed between rollers or otherwise subjected to pressure to express or squeeze out the dissolved glutinous matters, the process will be still further facilitated and otherwise greatly improved.

Another improvement in the preparation of this kind of vegetable fibre consists in operating upon the plants or stalks in an exhausted vessel. In carrying out this part of my invention, the flax or other fibrous substance is pulled and dried in the field, and the seed removed in the ordinary manner. The flax is then placed in a cylindrical or other shaped air-tight vessel, and the air is exhausted therefrom by means of an air-pump or otherwise, after which I let into the exhausted vessel a solution of one of the following materials,—either caustic ammonia or chloride of sodium or sulphate of soda or any neutral salt of any of the alkalies of ammonia, soda, or potassa. These materials I add in or about the proportion of one part of ammonia, or one pound of one of the neutral salts to 150 gallons of water, which should be kept at a temperature of from 90° to 120° of Fahrenheit. By exhausting the vessel and drawing out the air contained in the cellular tissues of the plants, the latter will be brought into a condition to be more easily and rapidly acted on by the chemical agents employed. The alkaline solution being now let into the exhausted vessel the flax will readily absorb it. In this saturated state it should be allowed to remain for from two to four hours, more or less, as may be required, after which the liquor should be run off from the vessel and the air again exhausted therefrom. This will have the effect of extracting the detached glutinous and other matters from the interior of the plant. After this second exhaustion, the fibrous materials are removed from the vessel and laid up in a heap, so that they may cool down gradually without fermenting, after which they should be spread out in a field or drying shed, and when dry they will be ready for breaking and scutching. Or, instead of using an alkaline solution, I sometimes employ hot water, merely letting it into the air-tight vessel after the air has been exhausted therefrom.

Instead of subjecting to mechanical pressure flax or other similar plants that have been steeped in open vessels, as described under the first part of my invention, I sometimes take the plant after it has been steeped long enough and place it in a cylindrical or other shaped vessel, and subject it to the exhausting operation for the purpose both of extracting the glutinous and other matters from the interior of the fibre, and removing the superfluous moisture.

Having now described my invention, and the best means with which I am at present acquainted for carrying the same into effect, I would observe in conclusion, that although I have stated certain proportions in which I propose to use the chemical ingredients having by experience found them to act in a satisfactory manner with the before named proportions, yet I do not mean to confine myself thereto, nor do I intend to confine myself to the use of the alkaline or neutral salts named, as other alkaline neutral salts will answer; nor do I intend to claim as of my invention steeping flax or other similar or analogous fibrous plants in warm or cold water or other chemical agents than those before named, for the purpose of detaching and removing the glutinous matters contained in the plant, except when such processes are carried on in conjunction with

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my improvements: but that which I consider to be new in the process above described, and therefore claim as the invention secured to me by the hereinbefore in part recited Letters Patent is,

1. Subjecting flax, line, grasses and other fibrous vegetable substances which have been steeped in water or other liquid, to mechanical pressure, for the purpose of expressing or squeezing out the detached glutinous and other matters contained in the plant.

2. I claim steeping flax, line, grasses, or other analogous vegetable fibrous substances in a solution of ammonia, or of chloride of sodium, or of sulphate of soda, or of any other neutral salt of the alkalis, ammonia, soda, or potassa.

3. I claim the employment in preparing of flax, line, grasses, and other fibrous vegetable substances, of the process of exhaustion as before exemplified and described, to accelerate the detaching from the fibre the glutinous and other matters contained therein.

Improvements in the manufacture of sugar and rum, part of which improvements are applicable to evaporation generally. MATTHEW HERRING, of Tonbridge-place, sugar-planter. Patent dated March 24, 1851.

1. *The Evaporator.*—This apparatus consists of a casing of any suitable shape, within which are placed a number of vertical metal plates, joined together so as to leave hollow spaces between them, in which spaces hot air, steam, hot water, or other heating medium circulates. The saccharine juice or fluid to be evaporated is supplied from above, and caused to trickle down the sides of the hot plates and pass into a receiver, from which it is returned, and repeatedly submitted to the evaporative action until concentrated, when (in the case of cane-juice) it is conducted away for crystallisation. In order to effect the purification of the juice simultaneously with its evaporation, the receiver may be provided with a filtering medium, through which the fluid may be caused to pass before being returned through the evaporating chamber.

2. *The Cleanser.*—The saccharine matter, after crystallisation, requires to undergo the operation of cleansing, to fit it for subsequent processes. With this view, the crystals are placed in a vessel of any convenient size, provided with a perforated false bottom, and liquor is pumped on them through a pipe furnished with a rose or jet, so as to cause it to be well dispersed over the crystals, and thus effect their purification by attrition. The liquor employed, which may be either cane-juice diluted to about 32° Baumé, or rum, passes off through the false bottom, and is pumped up for further use.

3. *The Continuous Still.*—This apparatus is constructed on the same principles as the evaporator above described. The wash is caused to traverse heated surfaces, by which the greater portion of the spirit is volatilised; the aqueous particles and the non-volatilised portion of spirit are subjected to a similar operation until all the spirit has been obtained. The vapors arising from this distillation are condensed in a worm, in the usual manner. The patentee has discovered that the quality of the rum thus produced, and that of rum generally, may be improved by subjection to the action of air, and with this view he causes a current of air to traverse and pass through the rum, and thus produces an improvement in its flavor.

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III. PHARMACY, MATERIA MEDICA, THERAPEUTICS &c.

GREAT EXHIBITION OF THE WORKS OF INDUSTRY OF ALL NATIONS, 1851. PRIZES AWARDED FOR CHEMICAL AND PHARMACEUTICAL PROCESSES AND PRODUCTS.

CLASS II. CHEMICAL AND PHARMACEUTICAL PROCESSES AND PRODUCTS GENERALLY.

J. DUMAS, *Chairman*, France; Former Minister of Agriculture and Commerce, Member of Institute, &c.
THOMAS GRAHAM, F.R.S., *Deputy Chairman* and *Reporter*, 4, Gordon Square; Professor of Chemistry, University College.
JACOB BELL, M.P., 15, Langham Place; Pharmaceutist.
MICHELE GALEANI, M.D. Sicily; Doctor of Medicine.
GEORGE GOSSLETH, Austria; Chemical Manufacturer.
JOHN MERCER, F.C.S., Oakenshaw, near Accrinton, Lancashire; Calico Printer.
H. L. PATTINSON, F.C.S., 10, Grey Street, Newcastle-on-Tyne; Chemical Manufacturer.
DR. VARRENTRAPP, Zollverein; Professor of Chemistry.

ASSOCIATES

Thomas Anderson, M.D., F.R.A.S., Edinburgh; Chemist to the Highland and Agricultural Society of Scotland.
— *Balard*,* France; Member of the Institute, &c. &c.
L. L. Bonaparte, France; Member of the National Assembly.
William Linton, 7 Lodge Place, St. Johns Wood; Artist.
A. Payen, † France; Member of the Institute, Professor at the Conservatory of the Arts and Sciences, Member of the Central Jury, &c.,
Eugene Peligot,‡ France; Professor at the Conservatory of Arts and Sciences, Member of the Central Jury,
John Percy, M.D., F.R.S., Museum of Practical Geology, London; Professor of Metallurgy.
J. Persoz,§ France; Professor of Chemistry at Petersburg, Member of the Central Jury, &c.

JURY AWARDS, CLASS II.

COUNCIL MEDAL.

NATION.	No. in Catalogue.	NAME OF EXHIBITOR.	OBJECTS REWARDED.
France and Algiers.	1620	Guimet, J. B. .	Artificial ultramarine.
Tuscany . . .	24	Larderel, Count F. de .	Boraic acid, and method of preparing it.
United Kingdom .	441	Longmaid, W. (Cl. I.) .	Process for treating pyrites with common salt.
France and Algiers.	1682	Prat and Agard . .	Salts of potash, and other products of sea-water.

* Juror in Class XXVIII.
† Juror in Class IV.
‡ Juror in Class XXIV.
§ Juror in Class XVIII.

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JURY AWARDS, CLASS II.

PRIZE MEDAL.

Nation.	No. in Catalogue.	Name of Exhibitor.	Objects Rewarded.
France and Algiers .	1049	Avignon, the Chamber of Commerce of	Garancine.
United Kingdom .	45	Barnes, J. B. . .	Valerianates.
Austria . . .	9	Batka, Wenzel . .	Metallic preparations, &c.
Prussia . . .	312	Bischof and Rhodius .	White lead.
Netherlands . .	1	Bleekrode, Professor S.	Oxide of Zinc.
United Kingdom .	48	Blundell, Spence, & Co.	Painters' colors.
France and Algiers .	1092	Bobée and Lemire .	Acetic acid and acetates.
Sardinia . .	12	Bonjean, J. . . .	Ergotine.
France and Algiers .	376	Bouxwiller Mining Co.,	Prussiate of potass, alum, &c.
United Kingdom .	27	Bramwell, T. & Co. .	Prussiate of potass.
Austria . . .	20	Brosche, F. X. . .	Succinic acid, and oxide of chromium and uranium.
United Kingdom .	57	Brown, F. . . .	Oxide of zinc.
——	7	Brown and Co. . .	Salts of ammonia.
Grand Duchy of Hesse	1	Büchner, W. . .	Ultramarine.
United Kingdom .	34	Bullock, J. L. . .	Rare organic products.
——	85	Burt, S. J. . . .	Cantharadine.
Belgium . . .	37	Cappellemans, & Co. .	Pink salt, &c.
France and Algiers .	723	Cerceuil, L. F. . .	Dyed flocks.
Prussia . . .	12	Cochius, E E. . .	Prussiate of potass.
France and Algiers .	802	Colville, Mlle. Anna .	Colors for porcelain painting.
——	1156	Conrad, W. . .	Chemical preparations.
Tuscany . . .	22	Corridi, G. . .	Santonine and other chemicals
France and Algiers .	462	Cournerie, & Co. . .	Iodine, &c.
——	807	Courtial, —. . .	Ultramarine.
Prussia . . .	458	Curtius, J. . . .	Ultramarine.
United Kingdom .	63	Dauptain, Gorton, & Co.	Ultramaride.
——	111	Davenport, J. T. . .	Chemical products.
——	62	Davy & Co. . . .	Glycerine, and various salts.
France and Algiers .	109	De Cavaillon . .	Salts of ammonia.
United Kingdom .	8	Dentith, W. & Co. .	Salts and coloring matters and oxide of zinc.
France and Algiers .	169	Drouïn and Brossier .	Printers' colors, &c.
Sardinia . . .	13	Dufour, L. . . .	Quinine.
France and Algiers .	1229	Fouche-Lepelletier .	Chemical products.
Bavaria . . .	12	Gademann, H. . .	Ultramarine.
United Kingdom .	92	Godfrey and Cooke .	Pharmaceutical products.
——	10	Hähnell and Ellis .	Sulphate of copper.
Austria . . .	26	Heinzen Brothers . .	Cudbear and archil.
United Kingdom .	24	Hemingway, A & W. .	Salts of iron.
Austria . . .	30	Herbert, F. P., Baron .	White lead.
Prussia . . .	683	Herrmann, O. . .	Glacial phosphoric acid, &c.
United Kingdom .	23	Hills, F. C. . . .	Sal ammoniac.
——	41	Hopkin and Williams .	Chemical products.
——	11	Howards and Kent .	Alkaloids, & other preparations.
——	13	Hurlet & Campsie Alum	Alum and prussiates.
——	86	Huskisson, J. W. & H.	Chemical products.
Wurtemburg . .	4	Jobst, F. . . .	Quinine.
United Kingdom .	90	Kent, J. H. . . .	Dried pharmaceutical herbs.
France and Algiers .	555	Kuhlmann Brothers .	Chemical products.

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JURY AWARDS, CLASS II.

PRIZE MEDAL—*continued.*

Nation.	No. in Catalogue.	Name of Exhibitor.	Objects Rewarded.
Prussia	13	Kunheim, Dr. Louis	Pink salt, and oxide of uranium.
United Kingdom	9	Kurtz and Schmersahl	Coloring matters, &c.
France and Algiers	580	Lefebre, T. and Co.	White lead.
——	308	Leroux, —	Salicine.
Prussia	875	Leverkus, C.	Ultramarine.
United Kingdom	107	MacFarlan, J. F. & Co.	Chemical products.
Prussia	464	Mathes and Weber	Chemicals, &c.
United Kingdom	14	May and Baker	Chemicals; mercurial preparations.
France and Algiers	916	Meissonier, Charles	Chemical products.
——	925	Menier and Co.	Pharmaceutical extracts.
——	640	Michel, A.	Extracts; coloring woods.
United Kingdom	17	Moberley, W.	Alum.
France and Algiers	325	Moreau, A.	Products of distilled bitumen.
United Kingdom	106	Morson, T. and Son	Organic products.
Prussia	328	Pauli, Otto	Phosphorus, &c.
United Kingdom	1	Pontifex and Wood	Tartaric and citric acids.
United States	262	Power and Weightman	Chemicals.
Nassau	7	Röhr, F.	Ultramarine.
Russia	28	Sanin, —	Salts of lead, &c.
Mecklenberg-Strelitz	3	Scharenberg, A.	Red lakes.
Russia	27	Schlippe, C.	Prussiates; alum, &c.
United Kingdom	61	Scott, L.	Oxide of zinc.
Wurtemberg	6	Siegle, H.	Red lakes.
United Kingdom	94	Smith, T. and H.	Aloine and cantharadine.
France and Algiers	1020	Sorel, —	Oxide of zinc.
United Kingdom	31	Spencer, J. A.	Chemical products.
——	63	Squire, P.	Chemical and pharmaceutical products.
Prussia	460	Stohmann & Wüstenfeld	Chemical preparations.
United Kingdom	119	Sturge, J. and E.	Red phosphorus.
Belgium	26	Vieille Montagne Zinc Mining Co., The	Oxide of zinc.
Austria	19	Wagenmann and Co.	Chloride of potassium.
United Kingdom	-	Walliche, Dr. N.	Collection of chemical and pharmaceutical preparations.
——	89	Ward, J.	Iodine, &c.
——	32	Watt, W.	Iodine, &c.
——	103	Watts, J.	Chemical and pharmaceutical products.
Prussia	684	Weiss, J. H.	Red lakes.
——	461	Wesenfeld and Co.	Sulphate of soda.
——	334	Wisemann, A. and Co.	Products of distilled schist.
United Kingdom	6	Wilson, J. and Son	Alum.
——	28	Winsor and Newton	Artists' colors.
——	7B	Young, J.	Stannate of soda; mineral oil; paraffine, from coals, &c.
Frankfort-on-Maine	3	Zimmer, C.	Quinidine.
France and Algiers	6153	Zuber, J. and Co.	Ultramarine.

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JURY AWARDS, CLASS II.

HONORABLE MENTION.

Nation.	No. in Catalogue.	Name of Exhibitor.	Objects Rewarded.
Sardinia	7	Albani Brothers	Chemical products.
France and Algiers	1541	Anthelme, —	Alum.
Prussia	826	Augustin, H. F. L.	Acetate of lead.
Austria	9	Batka, W.	Oxides of chromium & uranium.
——	34	Bigaglia, Pietro	White lead.
Prussia	313	Bleibtreu, L.	Alum, &c.
Belgium	42	Brasseur, E.	White lead.
Austria	21	Braun, G. J.	Stannate of soda.
France and Algiers	438	Brière, A.	Arsenical preparations.
Russia	29	Brusghin, Alexander	Prussiate of potash.
United Kingdom	4	Buckley, J. the Trustees of the late.	Copperas.
——	3	Button, C.	Collection of chemicals.
Sardinia	11	Calloud, F.	Phloridzin.
United Kingdom	26	Clifford, G..	Process for restoring parchment deeds injured by fire.
——	228	Cobbold, E. (Cl. 1.)	Peat products.
France and Algiers	1153	Coignet and Son	Phosphorus.
——	801	Collas, M. A. C.	Coal tar.
United Kingdom	15	Cook, T. A.	Carbonate of soda.
——	118	Copney, W.	Single crystals of salts.
France and Algiers	1180	Delignou, V.	Oil of schists.
Prussia	7	Dubois, C. A.	Samples of cinnabar.
United Kingdom	58	Ellem, Jones, and Co.	Various pigments.
——	227	Evans, G. (Cl. 1.)	Peat products.
Belgium	38	Floreffe, Société de	Chemical products.
United Kingdom	55	Fowler, J.	Benzoic acid.
——	44	Fox and Barrington	Various chemicals.
France and Algiers	1245	Gautier-Bouchard	Various colors.
United Kingdom	75	Hayes P., and Co.,	Resin oils.
Austria	32	Herbert, Ignaz, Baron	Red lead.
Prussia	465	Hesse, the Electoral Blue Color Works of, Schwarzenfels	Cobalt and smalts, ultramarine.
——	44	Heyl, J. F., and Co.	Preparation for staining paper.
Austria	14	Hochberger, Johann	Sulphur, alum. &c.
United Kingdom	60	Johnson, J. R.	Extracts, madder, &c.
——	102	Keating, T.	Matico, and other drugs.
Austria	27	Kinzelberger and Co.	Various colors.
——	24	Kutzeu and Lehrer	Ultramarine, &c.
France and Algiers	581	Lefèvre, sen.	Oxide of zinc.
United Kingdom	16	Lindsay, G.	Copperas.
Prussia	8	Lucas, Moritz	Samples of cinnabar.
France and Algiers	317	Maire and Co.	Vinegar.
Prussia	327	Marquart, Dr. L. C.	Bisulphide of carbon, &c.
United Kingdom	68	Marshall, J.	Lichens.
——	2	Melincrythan Chemical Company	Acetate of lead.
United Kingdom	1	Miller, T. (Fine Art Court) (Cl. xxx.)	Various pigments.
Tuscany	26	Mussini, Professor	Colors in fresco.
Hesse, Grand Duchy	8	Oehler, K.	Tar oil.

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JURY AWARDS, CLASS II.

HONORABLE MENTION—*continued.*

Nation.	No. in Catalogue.	Name of Exhibitor.	Objects Rewarded.
United Kingdom	225	Oxland, Robert (Cl. I.)	Peat products; the separation of wolfram from tin.
——	485		
——	113	Oyler, S.	Specimens of lint.
——	33	Picciotto, M. H.	Purified gum.
——	121	Pinto, Perez and Co.	Acetate of lead.
——	1	Pontifex and Wood	Rochelle salt; white lead.
Netherlands	2	Poortman and Visser	White lead.
United Kingdom	108	Pound, M.	Bail, a new astringent drug.
——	7	Reeves and Sons (Fine Art Court) Cl. xxx.)	Various pigments.
——	6	Robertson and Co. (Fine Art Court) (Cl. xxx.)	Various pigments.
——	240	Rogers, J. (Cl. I.)	Peat products.
France and Algiers	1452	Rosselette, C. P. H.	Chemical preparation for restoring gold and silver embroideries.
United Kingdom	3	Rowney and Co. (Fine Art Court) (Cl. xxx.)	Various pigments.
——	59	Russell and Robertson	Chromate of lead.
Sardinia	10	Saluce, M.	Pharmaceutical collection.
Spain	242	Santo, Ambrosio	Collection of pharmaceutical preparations.
Bavaria	14	Sattler, W.	Various Lakes.
——	15	Schruck and Uhlich	Ultramarine.
Austria	23	Setzer, Johann	Cadmium yellow, and ultramarine.
United Kingdom	7	Spence and Dixon	Alum
——	20	Stevenson, W.	Carbonate and bicarbonate of soda.
Netherlands	3	Stratingh and Co.	White lead.
United Kingdom	7A	Tennants, Clow, and Co.	Various salts.
——	21	Tulloch, A.	Materials used in the manufacture of gunpowder. &c.
Austria	18	Weber, G. D.	Cream of tartar.
United States	43	Wetherhill and Brother	Various salts.
United Kingdom	47	Wood and Bedford	Lichens.

MAGNESIA AS AN ANTIDOTE FOR THE SALTS OF COPPER.

BY M. ROUCHER.

THE author has published observations which tend to prove:—

1. That calcined magnesia entirely arrests the symptoms of poisoning by sulphate of copper, when it is administered sufficiently soon after the poison has been swallowed.

2. That the dose of magnesia necessary for neutralising the effects of the salt in question is at least 8 grammes of antidote to 1 of the sulphate.

3. That magnesia, acting with the other salts of copper in the same manner as with the sulphate, and preventing the existence of a green soluble salt of copper in its presence, it is very probable that it may serve as an antidote for all the salts of copper.—*Gazette Médicale de Strasbourg.*

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REPORT MADE TO THE ACADEMY OF MEDICINE ON THE SUBSTITUTION OF AN ARTIFICIAL IODISED OIL FOR COD LIVER OIL.

BY A COMMITTEE COMPOSED OF MM. GIBERT, RICORD, SOUBEIRAN AND GUIBOURT (REPORTER).

On the 20th of August, 1850, the Academy appointed the above committee to examine a memoir by M. Personne, Principal apothecary to the Hôpital du Midi, entitled, *Researches on cod and skate liver oils, and preparation of an iodised oil capable of replacing them in medical use.*

On the 10th September following, a note on the same subject presented by M. Deschamps of Avallon was sent to the committee; and on the same day a note from M. Marchal, of Calvi, claiming priority of employing iodised oil of sweet almonds, as a substitute for cod-liver oil was also transmitted to us.

We now report to you on these three memoirs and the experiments by which their examination was accompanied.

Cod-liver oil has long been an article of considerable commerce owing to its marked superiority over the other animal oils for the preparation of chamois leather; but it has been scarcely 20 years in use in medicine. Employed at first in rheumatismal pains, then in laryngeal phthysis and successively against all forms of scrofulous affection and against phthysis pulmonalis, is now one of the most commonly used of therapeutical agents, and one of those on which physicians place most dependance, either for the cure of these formidable diseases, or for delaying for a shorter or longer period the fatal termination.

The most important memoir which has been published on the nature of cod-liver oil is that of Dr. Jongh, which teaches us the composition of their commercial varieties, designated *black, brown and white cod liver oils.* Of this great work we shall mention only that these oils have been found to be composed principally of oleïc acid, margaric acid and glycerine, and, as accessory bodies, of butyric acid, acetic acid, of some principles belonging to the bile, of a yellow or brown non-nitrogenous coloring matter, called *gaduine*, iodine, phosphorus, and some inorganic salts. In France, MM. Girardin and Preissir have compared cod liver oil and skate liver oil, and have insisted on the superiority of the latter for medical use; but this superiority was partly founded on the fact that skate liver oil, when carefully prepared by pharmaceutists, transparent and of a golden yellow color, is much less repugnant to the patient than the cod liver oil of commerce, which was then generally turbid, blackish and of a very disagreeable taste. This is no longer the case. Recent experiments have likewise shown that little dependance is to be placed on the characters given for distinguishing the two kinds of oil, on account of their variability.

According to MM. Girardin and Preisser, these oils contain iodine in the state of iodide of potassium, and the proportion of it is much smaller than found by Dr. de Jongh, who found in 1000 grammes:

	gr.
Black cod liver oil...	0·295 of iodine.
Brown.....	0·406
White.....	0·374

MM. Girardin and Preisser found per litre.

Skate liver oil.....	0·150
Cod liver oil.....	0·180

According to M. Gobley, a litre of skate liver oil, prepared by the direct action of heat, contains 25 centigrammes of iodide of potassium. M. Gobley has not been able to detect phosphorous in this oil.

Such were the principal analytical results known, when M. Personne presented his memoir to the Academy. Their small amount of certainty and the great variations which are remarked in them, led that chemist to ask himself the following questions.

1. Do cod and skate liver oils contain iodide of potassium or iodine?

2. Do the various kinds of these oils contain the same quantity of iodine?

3. Do these same oils contain phosphorus, to which may be attributed, as some think, part of their properties?

To prove the presence of iodine, M. Personne saponifies the oil with an excess of pure potassa; he incinerates the soap obtained and treats the product of the incineration by alcohol of 90 degrees. He evaporates the alcohol, redissolves the product in water, and adds to it solution of starch and sulphuric acid. The intensity of the blue color enables us to judge of the quantity of iodine: it is always too small to be appreciated by the balance.

M. Personne has tested in this manner the deep brown and turbid cod liver oil employed in the hospitals of Paris; the transparent and almost colorless oil obtained from England, and skate liver oil prepared by the direct action of a moderate heat and filtration. The following are the conclusions drawn from his experiments:—

1. The brown cod-liver oil of the Paris hospitals contains more iodine than the

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beautiful white oil of English commerce.

2. It contains also more than skate liver oil, and yet it certainly contains less than a decigramme of iodine per kilogramme.

3. The residue of the preparation of skate liver oil contains much more iodine than the oil which has been separated from it.

We regret that M. Personne has not endeavoured to determine more precisely the quantity of iodine in the oils which he examined; for if this quantity is so small as he states, and which has also been found by M. Rabourdin, who fixes at only 28 milligrammes, the quantity of iodide of potassium furnished by a kilogramme of brown cod liver oil, it becomes very difficult to attribute to iodine exclusively, or even principally, the well proved effects which cod liver oil promptly produces in scrofulous affections and phthysis pulmonalis. This may be said without diminishing the interest which attaches to the medical employment of an oil artificially charged with a much larger and a known proportion of iodine.

M. Personne likewise investigated the question as to whether the iodine exists in the oil of fish livers, in the state of direct combination with the other elements of the oil, or in that of iodide of potassium. Admitting that this question has appeared to ourselves very difficult to decide, we regret that he has not done so in a manner free from objection. Indeed, from the fact that a pommade made with fat and iodide of potassium, after being colored by oxygenation in the air and again rendered white by age, presents in the portion which has become liquid, filtered and transparent, a proof of the presencee of iodine, it does not follow that this iodine is not combined with potassium, because there is no reason why a minute quantity of iodide of potassium may not be dissolved in the fatty body. We confess, however, that we are more inclined to think with M. Personne, and that we admit without difficulty the explanation which he gives of the manner in which the iodisation takes place. M. Personne having found that the tissue of the liver contained much more iodine than the oil, he considers that this iodine exists in the liver in the state of iodide of potassium; that this iodide is decomposed under the influence of the air and of the fatty acids formed during the preparation of the oil, and that the iodine acting then on the oil by substitution, is divided thus into two parts, one of which removes hydrogen ftrom the oil and eliminates it under the form of hydriodic acid, and the other takes the place of the hydrogen. It is at least very probable, that if the iodine exists in the oil in the state of direct combination, that things occur thus. The search for phosphorus was made in the following manner:—

The oil saponified by potassa was mixed with nitre and submitted to deflagration, the product dissolved and saturated with hydrochloric acid was filtered, neutralised by ammonia, then treated with chloride of barium, which should precipitate phosphate of baryta. But neither cod nor skate oil gave a trace of it.

The residue of skate liver oil, resulting from the extraction of the oil, having been treated directly with nitre, and the alkaline product dissolved in hydrochloric acid, the filtered liquor immediately precipitated phosphate of lime by the addition of ammonia. The author has omitted to say whether the filtered liquor was precipitated by chloride of barium.

Thus, if phosphorus has been found in some samples of cod or skate liver oil, this principle must proceed from the phosphate of lime contained in the attenuated debris of the liver, which are most frequently held in suspension in the oil. We have seen above that M. Gobley could not extract phosphorus from skate liver oil which he himself had prepared. There is, therefore, reason to think that phosphorus contributes nothing to the medical properties of these oils.

But however minute the quantity of iodine which exists in these animal liquids, it will be very difficult not to believe that this principle constitutes a great part of their properties, and seeing the very different quantities which have been indicated by chemists, M. Personne thought that it was useful to present to medicine a pure oil, combined artificially with an uniform and determined quantity of iodine. This oil will not, perhaps, replace cod liver oil in all cases,* but it cannot be doubted that, as a

* We distinguish three principal agents of the reparatory action which cod liver oil exerts in rachitic consumption, hæmoptysis, and phthysis pulmonalis: first iodine, which we cannot omit however small its quantity may be; the oily matter itself, which furnishes to the respiration the combustible element proper for sustaining the animal heat, without any expence to an emaciated body; and finally, the acrid and aromatic principle of the fish oil, a body perhaps more nearly resembling creosote than butyric or phocenic acid, which must be regarded as the preserving principle of chamois leather, and as the agent of the hæmostatic property of the

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special agent, presenting the iodine combined with an assimilable substance, which makes it penetrate throughout the system, and gradually yields it thereto, in proportion as it is burned in the circulatory apparatus, it becomes a powerful modifier of derangements of the lymphatic system.

To prepare the iodised oil, M. Personne first dissolves 1 gramme of iodine in 100 grammes of olive oil or oil of sweet almonds. The liquid, which is at first of a deep color, gradually loses this color and resumes its natural tint in about thirty-six hours; it again becomes colored and acquiresa brown tint which is removed by agitating the oily liquid with a weak solution of bicarbonate of potassa.

The oil on which the iodine has been made to act presents an acid reaction to litmus paper, and by treating it with bicarbonate of potassa, half the iodine employed is evidently removed from it in the state of hydriodic acid. The iodised oil retains the other half of it, that is to say, half a gramme in 100 grammes, or 5 grammes in 1000, or 175 times as much as cod liver oil according to M. Rabourdin. It is evident that this oil cannot be compared to cod liver oil; it is a different medicament, but may present great advantages in therapeutics, as will be seen from the experiments which we shall communicate to the Academy.

We may remark in passing that this circumstance of the division of the iodine into two equal parts, one of which is removed in the state of hydriodic acid, and the other remains combined with the oil, is a proof of the correctness of M. Personne's theory, namely, that the iodine is substituted in the oil, for one equivalent of hydrogen, which necessarily takes, in order to pass to the state of acid, a proportion of iodine equal to that which has produced the substitution.

Since the presentation of his Memoir, M. Personne, without changing the proportions employed, has modified the preparation of the iodised oil in the following manner.

He dissolves 5 grammes of iodine in 1 kilogramme of oil of sweet almonds, and then drives into the liquid a current of steam until it is completely decolored. This done, he adds 5 grammes more iodine, and continues the steam, until, as the first time, the liquid is completely decolored. It is also preferable to add the second quantity only by portions at a time, in order to avoid the product remaining colored, in consequence of the action of the iodine on other principles contained in the oil.

In operating in this manner, no trace of the vapor of iodine, indicating its loss, is perceived. The water which condenses has a very acid reaction, due to the hydriodic acid. It is decanted at once, and the oil is washed with a weak solution of bicarbonate of potassa or soda, until the acid reaction has entirely disappeared, finally, it is allowed to settle and filtered through paper.

By adding new and fractioned quantities of iodine, twice as much, or even more, might be introduced into it; but, whatever precautions may be taken, it is difficult to avoid obtaining a deeply colored product.

When 40 grammes of medicinal iodised oil (containing 5 grammes of iodine in 1000) are taken into the stomach, iodine does not make its appearance in the saliva for an hour and a half.* The iodine manifests itself more and more during 12 hours, after which it diminishes; it is still perceptible after eighteen or twenty hours, and even after twenty-four hours; it disappears almost completely after thirty hours. This experiment, which is easily repeated, gives the measure of the time necessary for the destruction of the fatty body to commence in the circulatory system, and of that necessary for its complete destruction. Indeed it is only the destruction of the fatty body which can render perceptible in the system the presence of the iodine elementarily combined with it.—*Journal de Pharmacie et de Chimie*, September, 1851.

(*To be continued.*)

oil. This principle is evidently absent in iodised oil of sweet almonds.

* Its presence in the saliva was manifested by means of starch paste and sulphuric acid.

REMARKS ON SEVERAL SYRUPS.*

BY M. E. MOUCHON.

M. E. MOUCHON, who published, in 1839, a large work entitled, *Traité Complet des Saccharolés Liquides*, has continued to pay attention to this subject, which is of so much importance in Pharmacy. We now publish his recent remarks, which possess great value, proceeding, as they do, from a man who has made so many experiments on this subject.

SYRUP OF ASPARAGUS.

When the illustrious Broussais proposed the introduction of the syrup of asparagus points into therapeutics, and M. Chevallier published the formula which we have all adopted, we bowed respectfully to these two authorities, without examining whether their opinion was well founded. We con-

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tinued, therefore, to give exclusive preference to the points, to the prejudice of the other parts of asparagus, although the root of this vegetable has been known, since the time of Dioscorides, Galen, and other celebrated authors of antiquity, as exerting a very powerful action on the uropoietic organs, and although M. Gendrin had pointed out the extract of the lower parts of fresh asparagus, prepared according to the process of M. Vaudin, of Laon, as a powerful diuretic.

The chemical analyses which we possess, present to us, it is true, these two parts of the same vegetable as differing considerably from each other, although they both contain saline substances — acetate and phosphate of potassa, and phosphate of lime—which account the best for the properties which they possess: but these analyses, however entitled to respect from having been made by MM. Dulong and Robiquet, do not, in my opinion, testify more in favor of the points than of the lower parts. Now, if it be true that these two parts are proved to be active, why should not curative properties be found in that which separates them, in that white part which forms the middle, and which we reject as a totally inert substance. Its appearance, I grant, has nothing to recommend it; but it must also be admitted that the appearance of the root by no means leads us to expect the decided diuretic action which results from its use, and yet facts are so much in its favor that we dare not dispute that medical power which we deny to the central parts of the vegetable.

If when we prepare syrup of asparagus, either with both parts united, or with one or other separately, we always arrive at a result which leaves no doubt as to the real value of each of these three products. The syrup of the points has the most color, and that of the lower part of the asparagus the least; but, nevertheless, the taste of the three products is nearly the same. The most experienced Pharmaceutists might easily be deceived as to the nature of each of these syrups, and, if kept in ignorance of their origin, even pronounce in favor of that which Pharmaceutists are disposed to condemn; for he must be persuaded that syrup of asparagus is so much the whiter as the shoots employed are large, and therefore more charged with less perfectly elaborated nutritious juice, or, otherwise, much less active than that of the small, which, however, the most orthodox and conscientious pharmaciens condemn.

From the foregoing, I draw the conclusion that we are doubtless wrong in rejecting the white part of the asparagus; but as there might be some temerity in giving an opinion without more convincing proofs, I take from my notes facts which may, it appears to me, give it a certain degree of authority, without completely solving the problem by chemical analysis.

Two kilogrammes of asparagus points were bruised in a mortar, with a little water; after powerful pressure, sufficient water was added to the residue to make up 500 grammes of this liquid, and pressure was again applied.

From this operation result, after coagulation and filtration while hot, 800 grammes of a transparent liquid, of a deep color, which was reduced by evaporation to extractive matter of pilular consistence, weighing 34 grammes.

On the other hand a similar weight of the same asparagus, entirely deprived of the green part, furnished, by a similar treatment, a pilular mass of 45 grammes, not so deep colored, and possessing less taste than the foregoing, but still of very good quality.

It must not, however, be supposed that there is a greater proportion of extractive matter in the white part than in the green; for instead of 800 grammes of liquid which the first operation yielded, I collected in the second 1060. Now, as from each must be deducted the 500 grammes of water which aided in the exhaustion, it follows that 300 grammes of juice properly so called produced 34 grammes of extract, whilst 560 produced only 45. It is therefore evident that there is a difference of one-third in favor of the first extract, that is to say, that the one represents 12 per cent. of the product, whilst the other represents only 8 per cent.

It is certain that, without the aid of water, these results could not be obtained, asparagus yielding only from 5 to 8 per cent. of extractive matter, according as it is large, small, or of medium size. But supposing that the extract of the white part of the asparagus is less active than that of the points, it appears to me that the whole of the asparagus. (the green and white parts) might be employed, its juice might be extracted as in the ordinary way; the plant treated with water as I did in the case of the two extracts of which I have just spoken; both liquids filtered separately after coagulation by heat; the weight of the first might be ascertained; the second concentrated first, and both united and the

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concentration continued for a short time, or the whole may be reduced to the weight of the juice.

The juice of asparagus would not suffer from this concentration, since analysis has not detected anything volatile in its constitution; and the pharmaceutist, whilst saving expence, will obtain a syrup of far superior energy than that resulting from the use of the points alone.

It is doubtless unnecessary for me to add that by adopting the same mode for the preparation of the extract, nearly twice the ordinary profit would be realised. This extract would not, perhaps, possess the same degree of energy as that of the points alone; but I do not think there is anything in this of sufficient importance to cause us to reject the plan, since, if the product be less active, the dose in prescriptions can be augmented.—*Repertoire de Pharmacie*, Sept., 1851.

(To be continued.)

ON THE SELECTION OF ELECTRICAL APPARATUS FOR MEDICAL USE.

BY M. SOUBEIRAN.

When it is wished to apply galvanic electricity to the cure of diseases, the first question which presents itself is this: Is it immaterial what kind of electric current is used? As regards convenience, decidedly not. The voltaïc batteries, constructed according to known systems, require care and attention which the physician can seldom give them; their effects rapidly diminish, and if constant batteries be substituted for the ordinary apparatus, we find the same necessity of devoting time to preparing them, the expence of matters necessary for their maintenance, the very frequent renewal of some of their parts, and, moreover the inconvenience of the gas and vapors which are almost always exhaled. For all these reasons, the apparatus established on this system are almost entirely abandoned. This opinion held by practitioners can only be altered by presenting to them an apparatus free from these defects, or by proving that in certain circumstances the nature and the effects of the current produced by the battery have some special and necessary properties which cannot be found in currents of different origin.

Instead of electrical currents directly produced by the battery, scarcely any other than induced currents have hitherto been employed. They have the remarkable character of possessing only an instant's duration; they follow up, but leave an interval between each. It is for peculiar arrangements of apparatus to regulate the duration of these intermittences which may be very distant, or to render them so near that they resemble a constant current.

It happens that the induced current is developed by the influence of a current on a conducter placed in its vicinity. A first wire of very large diameter, covered with silk and rolled in the spiral form, receives the current from a voltaïc battery; it is covered with a second wire covered and rolled in the same way. It is in this second wire that the induced current is formed every time that the current of the battery is interrupted or reestablished in the first. This is the system which the brothers Breton adopted in their former apparatus, which were well received by practitioners, and yet the brothers Breton gave them up on account of the inconveniences inherent to the employment of voltaïc batteries. These inconveniences were, however, diminished, for a weak battery sufficed for producing energetic effects, seeing that the induced current which is developed is much more powerful than the primitive current, in consequence of the induction which the spires of the conductor exert on each other, and which may be still further increased by inserting in the coil a bar of soft iron. This sort of apparatus gives a rapidity in the intermittences, which is sometimes useful, and which cannot be attained with machines constructed by means of magnets.

In the magneto-electrical apparatus, the current is produced by the action of a magnet which approaches and departs from a spiral conductor. When the magnet is brought in contact, the wire is traversed by an induced current which lasts only an instant; when the magnet breaks contact, on the contrary, an induced current is also produced, which, this time takes a contrary direction to the first. Most frequently this arrangement is replaced by soft iron enveloped in a coil of metallic wire which alternately makes and breaks contact with the poles of a magnet; or else, the conducting wire is wound round the magnet itself and the soft iron, turning on its axes; successively comes in contact with the poles of the magnet, and modifies their magnetic state. A mechanical arrangement regulates the movements, and enables the currents to succeed each other with more or less rapidity. The apparatus does not require any preparation at the moment of use: it is always ready for action. This is certainly the cause which gives the preference to the apparatus constructed according to this

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system. I may add that the induced current which passes through a coil may react on another coil, and develope in it an induced current of the second order, which has peculiar properties distinguishing it from the first.

Here we touch on a difficult, delicate question, on which science is almost silent, into which, however, we must enter, although we are unable to solve it completely. However, there are some indisputable propositions which must guide us in the study of electrical apparatus.

Although physical science knows little concerning the true nature of electrical currents, and although it can only express vague distinctions between the properties of those which have not the same origin, still it can prove some essential differences. Thus, in two batteries, formed of the same elements, which differ only in their arrangement, there is a predominance of the phenomena of quantity or intensity. Must not only a simple difference of electrical tension be seen, or, indeed, similar in this respect to the light which passes through transparent colored bodies, do the currents undergo an analysis through the numerous conductors which they must pass through, and do they come out only with such of their parts as are alone capable of overcoming the difficulties of the transit? We are in doubt as to the cause, but we do not fail in distinguishing the effects. The currents of quantity pass, so to speak, without loss through the metallic conductors of sufficient diameter, produce the most beautiful magnetic effects, heat the metallic conductors when they are too small to admit of their easy passage, but are almost powerless in chemical effects. Currents of intensity, are especially distinguished by their power of producing the separation of the chemical elements of compounds.

The distinction to be established between currents of different origin is still more evident, if we compare those which are produced in the solution of metals, zinc and copper, for example. Whilst a chemical equivalent of each of these two metals, in dissolving in an acid, gives currents similar in intensity, capable of destroying each an equivalent of any chemical compound, these same currents differ in their effects of quantity, for the zinc current has the power of producing magnetisation with an incomparably superior energy.

Nor does physical science say any thing concerning the differences which induced currents may present between each other, according to their diversity of origin. Thanks to the labors of Dr. Duchenne, we are now further advanced as to their distinction in a physiological point of view. In the Memoirs which this learned physician has presented to the Academy, he has pointed out in each current very remarkable characters. His works will be summed up in a few sentences.

The galvanic current obtained directly with the battery has characters which are peculiar to it. In passing through the living organs, it developes in them a sensation of heat which is not observed in the employment of induced currents. This then is the principal seat of the manifestation of this phenomenon, which may extend from simple redness to deep and painful wounds. Its chemical action is powerful, and, in this respect, it should be selected in preference when it is desired to coagulate the blood in an aneurismal sac, to destroy any morbid production, or to change the nature of the excretions on certain ulcerated parts.

The current of the battery possesses, besides, quite a special action on the retina when it is applied to the muscles of the face, or to any part in connection with the nerves of the fifth pair, it reacts vividly on the organ of vision, producing sparks, lights, and flames which may attain extreme intensity. This phenomenon manifested with currents which have scarcely sufficient force to contract, in the state of health, the muscles of the face, whence the impossibility of applying them to the treatment of certain paralyses of this part. A patient was rendered blind for two hours in consequence of a galvanisation of this kind, although the appearance of flames had compelled M. Duchenne to desist from applying the current almost immediately.

Induced currents have properties which distinguish them from currents of the battery. They are necessarily intermittant; their chemical action is feeble, and, when they traverse the organs, they show themselves to be without calorific action. Whence it results that they are applicable only when it is required to act with great intensity, without producing disorganisation. Hence the advantage of apparatus in which the current of the battery is replaced by induced currents. The latter deserve greater preference for the electrisation of the muscles of the face, because they possess only an incomparably weaker action on the retina than we have noticed in the currents of the battery.

M. Duchenne has also ascertained that induced currents themselves, when they have a different origin, do not appear similar in their properties. One of them determines vivid muscular contractions, but it

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has little effect on the cutaneous sensibility. This is the induced current of the first order, which is produced in a coil traversed by the current of a battery at the moment when the circuit was established or interrupted. Such is also the induced current which is developed in a coil under the influence of a magnet.

Finally, when, by the influence of a first induced current (when it has a volta-electric or magneto-electric origin), when, under this influence, then is produced in a second coil an induced current of the second order, the latter is characterised by a special action on the cutaneous sensibility, which it excites to such a degree that it must not be employed in persons whose skin is very irritable.

The following are observations of a high interest with which M. Duchenne has enriched science, and which physicians should never lose sight of in the therapeutical application of electricity.

In the persevering study which M. Duchenne has made of the action of currents, he has again fixed the attention of practitioners on the necessity of measuring with accuracy the force of currents and of regulating it according to the susceptibility of the patients and of the diseased parts. This knowledge acquires great interest when it is required to compare the degree of sensibility of various muscles; but, it is also interesting in the application of electrical currents to the cure of diseases. With every apparatus which does not measure the power of the current, we are liable to make a rough or inefficacious application of electricity.

Finally, M. Duchenne calls particular attention to the intermittence of the currents. Continued currents are scarcely ever employed; they are resorted to only when by the aid of metallic conductors it is wished to determine a chemical action or a more or less powerful revulsion, whilst we always have recourse to the intermitting currents proper for producing effects of contraction and sensibility. In this case, the intermittences should be regulated with strict attention. Preserving all the force of the shocks, we must be able to distance them at will. Intense discharges repeated with too much rapidity may become intolerable and dangerous from the pain which they occasion; and still these same discharges, without losing any thing of their intensity, will be patiently borne by the patients, if they are a sufficient length of time apart. These effects are particularly remarkable in the application of currents to the diseases of children and very nervous persons: without intermittences, the employment of electricity in them would be of necessity renounced.

Now, an electrical apparatus being given, to appreciate it and to ascertain what assistance it may give, we see that we must ascertain :—

1. If it can place at our disposal various kinds of currents, and what is the nature of these currents?

2. If it has the power necessary for reaching muscles situated at a distance, sometimes under an abundant cellular tissue, or gorged with fatty matters; if this power may be moderated, and if it offers the means of being measured with regularity?

3. If it has a continued or intermittent effect; what is the duration of the intermittences, and if it is possible to relax them or hasten them in sufficient proportion?

4. If it is susceptible of duration, and convenient to use; if, indeed, in its application, it does not require certain more or less troublesome precautions on the part of the operator?—*Journal de Pharmacie*, September, 1851.

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ALBUMINOUS ENEMA OF NITRATE OF SILVER.

Dr. Delioux, professor of Materia Medica at the medical school of Rochefort, who has presented to the Academy a Memoir on the influence which albumen exerts on the absorption and assimilation of mineral compounds and on the employment of metallic albuminates in therapeutics, has also published an article in which he calls the attention of practitioners to the advantages which result from the association of albumen with nitrate of silver in diarrhœa.

In the first instance, Dr. Delioux, agreeing, in that respect, with M. Lassaigne, remarked that, although the nitrate of silver at first precipitates albumen from its solutions, a great excess of albuminous solution redissolves the precipitate; again, that although the alkaline chlorides precipitate nitrate of silver in pure water, in the state of insoluble chlorides of silver, they are not precipitated in albuminous water; that, finally, in these two cases, there is formed a compound of albumen and nitrate of silver, and consequently easily absorbable.

The albuminous lavements render great service in intestinal fluxes; they act as an emollient topic; but they are not sufficiently efficacious when they are connected with a general or local state of a certain

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degree of gravity: in these cases, the nitrate of silver acts much more energetically; it is a powerful modifying topic, and, as it acts as a substitutive or as an astringent, it is often sufficient of itself to dry up intestinal secretions when emollients fail. M. Boudin, who has extolled lavements of nitrate of silver (5 to 15 centigrammes in 150 grammes of water) in old standing diarrhœa with little sensibility of the large intestine, considers that they act even beyond the ileo-cœcal valvule and may modify ulceration of the small intestine, which, in phthysis or typhoïd fever complicate those atonic diarrhœas which it is so important to stop. Dr. Delioux with reason, finds two faults with nitrate of silver: 1st, it sometimes occasions very violent colic, even in small doses, of 10 or 20 centigrammes in 200 to 400 grammes of water, and more powerfully in greater doses, owing to its astrictive and irritant action: 2ndly, unless a glass or porcelain syringe be used, and this cannot always be done, it acts on the metal, which turns black everywhere that the liquid comes in contact with it, which frequently alarms the patients, who can with difficulty be persuaded to take a medicament which is capable of acting on metal; moreover, the solution of silver, is partially decomposed by the metal of the syringe and the patient receives a mixture of a salt of tin and a salt of silver, a defective medicament differing in quality and dose from that which the physician has prescribed. It is especially with the view of obviating these inconveniences and at the same time to give the patients the benefit of the therapeutical properties of the albumen as well as of the nitrate of silver, that M. Delioux recommends employing the nitrate of silver, either in the pure albuminous water, or in albuminous water to which a little chloride of sodium has been added; when the proportion of nitrate of silver is very small, the chloride of sodium is useless; but if the nitrate of silver be employed in the proportion of 20, 30 or 40 centigrammes to 250 grammes of albuminous water, chloride of sodium must be added in the same proportion; for example, the formula for a lavement may be given as follows.

The white of one egg is to be dissolved in 250 grammes of distilled water: this solution is to be strained through a cloth, and 10, 20, or 30 centigrammes each of nitrate of silver and chloride of sodium are added. The two salts are dissolved separately in a very small quantity of distilled water. The solution of nitrate of silver is first poured into the albuminous liquid; at first a slight white floculent precipitate is formed; the solution of chloride of sodium is then immediately added; the mixture is stirred with a glass rod; the precipitate then disappears and the liquid resumes its transparency, or sometimes retains a slight opalescent tint, but deposits no precipitate. A soluble combination of nitrate of silver and albumen is formed, in which the chloride of sodium does not take any part beyond favoring and maintaining its solubility.

This solution of nitrate of albumen and silver should be prepared only at the time it is to be administered, because the reduction of the oxide of silver takes place with great promptitude by the action of light and of the organic matter. When kept, the solution acquires a black color, depositing metallic silver, and loses its therapeutical activity. It is also remarkable that this albuminous solution of nitrate of silver is reduced only very slowly by means of metallic plates, so that the tin of the syringe exerts no decomposing action on it. Dr. Delioux also affirms that his albumeno-nitrate of silver lavements cause no colic, that they have no appreciable topical action, or at least that they have not the astrictive and irritating action of the lavements of nitrate of silver without albumen, which irritating action causes them to be immediately expelled, whilst the albuminous lavements are retained well and sometimes allow the intestine to absorb the whole, but always a portion of the salt of silver which may be carried to from 60 to 75 centigrammes at one time, without causing any irritation.

According to Dr. Delioux, as it often happens that derangements of the secretion of the intestine are not accompanied by any anatomical lesion of the mucous membrane, it is not without importance to provoke a dynamic action and to have a medicament which may be absorbed and does not act solely as a topical agent. Now the nitrate of silver pessesses very well marked dynamic properties; it is an antispasmodic and a sedative, it is an alterant, and it may have a much longer action as a modifier of the nervous influx and of certain kinds of humoral dyscrasies than as a topical irritant agent. Moreover, in the cases where inflammation, ulcers, &c., exist, these do not constitute the whole of the disease, and the topical action is not all that should be kept in view.—*Bulletin Générale de Thérapeutique.*

ON THE TREATMENT OF ITCH.

The following discussion on the subject took place at a recent meeting of the Société Medicale des Hôpitaux:—

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M. HARDY. On arriving at the Hôpital Saint-Louis, I found the treatment of itch instituted in the following manner by M. Bazin. The patient takes a bath on entering; in the evening he is rubbed with the sulphuro-alkaline pommade of Helmierick. On the second day, at six o'clock on the morning, another bath and general friction, on the third day a bath, and the patient is discharged cured. This treatment has failed in only 6 cases in 700 in which it was adopted. I have tried several experiments with the view of reducing the duration of the treatment which evidently has no other object than to kill the acari, and I have been enabled to cure the itch in two hours. On the arrival of the patient, I cause him to undergo a general friction for half an hour with black soap. This friction has the effect of cleaning the skin and breaking the pimples. I afterwards give the patient a bath for an hour, and have him rubbed during this time to soften the epidermis and complete the rupture of the pimples, then I have him rubbed for half an hour with the ointment of Helmerick, all over his body. The patient is cured after this friction, which has killed the acari. I do not speak of secondary eruptions, which disappear after a few simple baths, and which are in no way due to the itch. Of 400 patients whom I have treated thus, only 4 have suffered relapse. Of these 4, two were infants who were not well rubbed, and 2 others might have contracted the itch again.

Of the 145 patients whom I treated in the month of June, I watched a dozen in order that the fact of the cure might be perfectly confirmed.

I may add that this rapid cure obviates the necessity of receiving the patients into the hospitals, who constitute a certain expence to the Hôpital Saint-Louis, and who will be perfectly cured as out-patients.

M. DEVERGIE. I do not deny to M. Bazin the merit of having considerably abridged the duration of the treatment of itch, but I may remark that in the year 1816, masses of patients presented themselves at the Hôtel Dieu afflicted with itch, and at that time Dupuytren employed frictions all over the body with sulphuret of potassium. Since then, this treatment has undergone singular oscillations: and at length only partial frictions were made, and only the hands and feet rubbed with ointment. I have doubted whether, in certain cases, it was not injurious thus suddenly to suppress a disease affecting a large portion of the surface of the skin, for, in certain cases, I have seen manifested, owing to sudden suppression of skin diseases, pulmonary congestion and even abcesses.

M. HARDY, observed that he had seen boils appear after itch, but never serious symptoms.

M. REQUIN.—M. Bazin. cures itch in two days, and M. Hardy, in two hours; but for a very long time I have cured this affection in two minutes, and that by a means the invention of which is due to M. Aubè, by friction with turpentine. The friction should be general. This is a plan which I have employed for a long time which I have always found successful, and which I am surprised has not been alluded to here.

M. HARDY. Turpentine is not free from inconvenience, and I think my plan excellent, because it is not only as insecticide as turpentine, but because it has the advantage of reaching the insects wherever they exist and breaking the pimples by the bath and friction.

M. TROUSSEAU.—I quite understand the utility of breaking the pimples containing the acari, but, formerly, by Pihorel's meg thod the frictions were made absolutely only in the palms of the hands; the treatment lasted 18 days, and the patient was cured by a kind of sulphurous impregnation.—*Gazette des Hôpituax.*

NOTE ON THE COMPOSITION OF THE HYDRATES OF SESQUIOXIDE OF IRON, AND OBSERVATIONS ON THE EMPLOYMENT OF ONE OF THEM AS AN ANTIDOTE FOR ARSENIOUS ACIDS.

BY M. .I LEFORT.

A NOTICE of M. Wittstein on the modifications which hydrated sesquioxide of iron undergoes in water has afforded me an opportunity of making some remarks on the composition of the hydrates of sesquioxide of iron.

This subject, although it has been several times treated by chemists, still leaves much to be desired.

Whatever mode of precipitation may be employed, the alkalis furnish with the persalts of iron only two hydrates which may be thus represented:—

$$2\,Fe^2O^3 + 3\,HO$$
and $$Fe^2O^3 + 2\,HO$$

The first is obtained whenever a hot solution of a salt of iron is treated with a hot solution of potassa or soda.

I have analysed it when it lost no more water over sulphuric acid, and found it to

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contain 14·82 and 14·55 of water. Calculation gives 14·44.

Exposed to the action of heat, it may be dishydrated at from 176 to 212° F.

The second hydrate is formed when a cold solution of potassa, soda or ammonia is poured into a cold solution of a salt of iron: it has less density and a less deep brown color than the foregoing.

It begins to lose its water towards 167° F.

Two analyses gave me 18·23 and 18·40 per cent. of water. Calculation gives 18·36.

Several chemists have assigned formulæ to hydrates of sesquioxide of iron which had been prepared by means of alkaline carbonates both cold and boiling.

I have repeated all these experiments, and I have always found, in the oxide formed, quantities of carbonic acid amounting to from 2 to 6 per cent.

The latter of the hydrated oxides of iron which I describe is employed, as is known, as an antidote for arsenious acid.

On this subject, M. Wittstein has observed that when it had been prepared for some time, even after six months, it lost half of its water, acquired a crystalline texture, and consequently became much less soluble in the acids than when it was recently prepared.

The importance of this observation, if well founded, will be readily understood.

In order to settle the matter, I have examined hydrated sesquioxide of iron which I had kept in water for three years; it gave by analysis the same quantity of water as that which I had prepared only a few days before.

Viewed through the microscope, it did not appear to possess the least crystalline form; put in contact with dilute acids, it was dissolved as promptly as that recently obtained.

Medical observation confirms the anticipations of the chemical analysis.

On the 12th of May, 1848, at 9 o'clock in the morning, B——, a butcher, 35 years of age, of athletic appearance, addicted to drinking, swallowed with the intention of self destruction, 30 grammes [nearly an ounce!] of arsenious acid, in a glass of wine, and then threw himself on his bed, where, owing to copious libations during the day, it was not long before he slept. At noon he awoke and in despair, but convinced that he was going to die, he took at one draught, a bottle of white wine: at about 2 o'clock, unusual cold, colic and intense vomiting commenced, and continued until 4 or 5 o'clock: his thirst was unquenchable, and he drank at least twenty quarts of water during this time.

Being called in at 11 at night, the physician gave B—— about 300 grammes of hydrated oxide of iron which I had kept under water for more than two years.

This man, whom the physician left at night with the countenance discomposed, the skin damp and cold, in fact in a desperate state, rose next morning and appeared to be in a satisfactory condition; next day, the 14th, no trace of the poisoning remained.

These facts speak for themselves, and are sufficient, I think, to demonstrate that hydrated sesquioxide of iron, although inferior to hydrate of magnesia as an antidote for arsenic, is yet a valuable antidote even when it has been kept for a long time.—*Journal de Pharmacie*, October, 1851.

NEW MODE OF STOPPING HICCUP.

BY DR. PIRETTI.

Dr. PIRETTI appears to have found a very simple means of arresting this disagreeable and often very obstinate symptom. It is sufficient to squeeze the wrist, preferably that of the right hand, with a piece of string, or with the fore finger and thumb of the other hand.—*Journal de Chimie Médicale.*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

RESEARCHES ON THE CONSTITUTION OF THE ATMOSPHERE.

BY M. B. LEWY.

In the instructions with which the Academy honored me on my departure for South America, it was kind enough to point out to me the interest which would attach to new researches on the constitution of the atmosphere. Having formerly been occupied with these same researches, in the work on the composition of the atmospheric air in the North Sea, in Copenhagen, and in Guadeloupe, under the instruction of the Academy in 1842, I thought it my duty to devote the commencement of my stay in Bogota to these researches.

The memoir which I now have the honor to submit to the judgment of the Academy, contains the results of a series of researches on the constitution of the atmosphere, executed from France to New Grenada, and from the coast to 3193 metres above the level of the sea.

MM. Dumas and Boussingault, in their memoir on the true constitution of atmospheric air, having already discussed all the works of the chemists and physicists who had previously occupied themselves with these investigations, I think I may here dispense with the history of these labors. It remains for me to compare my results with those obtained by the men of science who have more recently made similar investigations. I do this in the course of my memoir.

The analyses which form part of this memoir were performed by the new process of MM. Regnault and Reiset, which consists, as is known, in analysing the air by volume. To measure the elastic forces of the gas, I used an excellent cathetometer, constructed by M. Perraux. This process thus combined, as MM. Regnault and Reiset had foreseen, enables us to obtain greater precision than has hitherto been arrived at in this kind of researches. To judge of the degree of accuracy which may be attained to, it is sufficient to examine the numerical details of the analyses, and it will be seen indeed, that the greatest difference between two analyses of the same sample of air has never exceeded $\frac{1}{10000}$; most frequently it has been only $\frac{1}{100000}$.

The various samples of air which I have analysed were collected in bulbous tubes, drawn out and open at both ends; these tubes were of the capacity of about 100 cubic centimetres. The air was taken in the following manner:—One of the ends of these tubes was put in communication, by means of a caoutchouc tube, with a small pair of bellows, which I worked sufficiently long to assure myself that all the air contained in the tube was replaced by the atmospheric air of the place where I was, and I also took the precautions necessary for avoiding a mixture of the air of the respiration with that which I intended to analyse. When the air was taken the tubes were immediately sealed in a lamp.

I have divided into three series the analyses which form the subject of this memoir.

1. The analysis of the atmospheric air of France.

2. The analysis of the atmospheric air of

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the Atlantic Ocean and the Carribean Sea.

3. The analysis of the atmospheric air of New Grenada.

The comparison of the results obtained in this work with those previously obtained, proves that the constitution of the atmosphere is nearly the same in the old world and in the new. Taking the mean of the analyses performed in eleven different localities of New Grenada, we find that 10,000 volumes of warmed atmospheric air contain 4·008 of carbonic acid, 2101·425 of oxygen, and 7894·557 of nitrogen: these are sensibly the same proportions as those found for normal atmospheric air in various parts of Europe. However, in examining with care all the works hitherto executed on the composition of the atmosphere, it is easy to see that the composition of the air is not absolutely uniform; there exist perceptible differences which vary with meteorological circumstances. Thus, after long continued rainy weather, the carbonic acid and the oxygen contained in the atmosphere are always found in smaller proportion than after long continued dry weather; but these differences become appreciable only when the analysis has been made with great accuracy, and within a few ten thousandths.

In the New World, where the seasons are more distinct than in Europe, these variations are more easy to prove; during the fine season, normal air always contains rather more oxygen and carbonic acid than during the rainy season. Thus, in taking the mean of a great number of analyses, I have found that 10,000 volumes of normal atmospheric air of Bogota contained

	Under a dull sky, and in the rainy season.	Under a clear sky, and in the fine season.
Carbonic acid ..	3·822	4·573
Oxygen	2099·542	2102·195
Nitrogen	7896·636	7893·232
Volume	10,000·000	10,000·000

The difference which exists between the atmospheric air of the two seasons is, then, on the average, 0·751 for carbonic acid, and 2·653 for the oxygen in 10,000 volumes of air.

Taking the maximum and the minimum of the results obtained in the analyses executed during the two seasons, we find

	Rainy season.	Fine season.
Carbonic acid ..	3·609	5·043
Oxygen.....	2099·032	2103·199
Nitrogen	7897·359	7891.758
Volume	10,000·000	10,000·000

The greatest difference is, consequently, 1·434 for carbonic acid, and 4·167 for oxygen. These differences are about the same as I found in the air of Paris, and in that of Haxre, analysed in meteorological circumstances corresponding to the two seasons of South America.

It follows, therefore, that the composition of the atmospheric air which we respire is in Europe and in the New World, perceptibly the same as regards the relation between the oxygen and the nitrogen, whether it be taken from the border of the sea, or 3000 metres above its level; a difference is found only in the quantity of carbonic acid which appears to be rather greater on the high mountains than in valleys and by the sea side.

As regards the analysis of air collected at sea they have given a very interesting result. During the day, this air contains constantly a little more oxygen and carbonic acid than during the night; as we get to a distance from the coast, this difference becomes more perceptible, and it is due probably to the solar rays, which, heating the surface of the sea during the day, disengage a portion of the gas which the water holds in solution. The air contained in solution in sea water is, as we know, much richer in oxygen and in carbonic acid than atmospheric air.

Taking as a term of comparison the samples of air collected on the Atlantic Ocean the same day, during the same wind, and at more than 400 leagues from the coast, we find

	At 3 a. m.	At 3 p. m.
Carbonic acid ..	3·346	5·420
Oxygen.....	2096·139	2106·099
Nitrogen	7900·515	7888·481
Volume	10,000.000	10,000·000

The difference is then 2·074 for carbonic acid, and 9·960 for the oxygen in 10,000 volumes of air.

The analyses of the abnormal air of New Grenada present no less interesting results.

Occasionally, perhaps once or twice a year, we find in the air of New Grenada, extraordinary proportions of carbonic acid, which coincide with an easily appreciated diminution of oxygen, and which, consequently, alter the constitution of the atmosphere very considerably.

The great number of volcanoes existing in the New World, and the clearings which are made in this country every year, may cause alterations: it is during the time of the great clearings, indeed, that the constitution of the atmosphere undergoes those extraordinary changes of which I speak.

These clearings, which are effected by extensive conflagrations, which are called in

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the country, *las quemas*, produce considerable quantities of carbonic acid, which, mixing with the atmosphere, perceptibly alter its composition. The proportion of carbonic acid which I have found in this air amounts, in some analyses, to 49 in 10,000 volumes of air; it is consequently, ten or eleven times as much as in normal air. The diminution of oxygen has sometimes been 68·350 in 10,000 volumes of air; instead of 2101·425 of oxygen, I have found only 2033·075 per 10,000 volumes of air: the diminution is, therefore, very easily appreciated, even by processes less delicate than that which I have used.

On the other hand, the air of the plains of Bogota sometimes presents a much larger quaatity of carbonic acid than the air of Tierra Caliente. The difference may be explained, either by the existence of volcanoes which are met with at a short distance from Bogota, or by the influence of a more or less active solar light. It may be conceived, indeed, that in Tierra Caliente, where the temperature is very high, the decomposition of the carbonic acid by the green parts of the vegetables, should be operated much more rapidly than on the plain of Bogota, where the temperature, as is known, is only from 57°2 to 64° F.

Seeing this enormous quantity of carbonic acid thus appears from time to time in the air of the New World, considering the great number of volcanoes which exist in that country, and which exhale, as is known, a considerable quantity of it, one may be permitted to think that a portion of the carbonic acid of the air is due to them, and that they thus contribute their part to nourish this vegetation of the tropics which is so beautiful, so rich and so rapid in its development.—*Comptes Rendus, No.* 13, 29 *September*, 1851.

ON THE COMBINATION OF ARSENIOUS ACID WITH ALBUMEN.

BY THORNTON J. HERAPATH, ESQ.*

[We are induced to reprint the following paper, from the *Philosophical Magazine*, as several papers connected with the controversy therein referred to, by Dr. Muspratt and others appeared in THE CHEMIST, New Series, Vol. I, 1849-50.]

NOT a little controversy has recently occurred amongst chemists with regard to the nature of the combination which is stated to take place between arsenious acid and albumen. According to Prof. Liebig,* these two bodies combine in atomic proportion and it is owing, he says, to this circumstance that the vitality of the organs is destroyed in cases of arsenical poisoning. The same opinion, it seems, is entertained by Dr. Sheridan Muspratt of Liverpool, who has lately published some results† which certainly appear to establish the truth of the hypothesis. Other chemists, on the contrary, say that this statement of Liebig's is founded on error—that arsenious acid does not, under any circumstances, form a true chemical combination with albumen, and is only separated by the latter substance from its solutions by a species of mechanical action; that is to say, somewhat in the same manner, perhaps, as iodine and many vegeto-alkaloids are well known to be absorbed and extracted from their solutions by animal charcoal.

In evidence, they adduce the results of Mr. Edwards's experiments, an account of which was published some few months back in the Transactions of the Chemical Society of London.‡ According to this latter experimentalist, the whole of the arsenious acid may be readily extracted from the compound by means of boiling water, provided the operator takes care "thoroughly to break up the mechanical network of the coagulate" (I adopt his own expression), by trituration with a pestle and mortar.

A short time ago, my attention was drawn to the subject by my father, Prof. W. Herapath, who desired me to repeat the experiments above referred to, with the view if possible of deciding the question, as it was one which he considered of much interest, in consequence of its bearings on Toxicology. I accordingly did so. My results may be summed up as follows:—

Experiment I.—499 grains of the glairy albumen of eggs were taken and intimately mixed, by long continued trituration with 3·0 grs. of arsenious acid; the latter having been previously dissolved in a quantity of water sufficient to effect a perfect solution. The mixture was then coagulated by heat, and afterwards carefully evaporated to dryness in a water-bath. The yellowish residue thus obtained was reduced to a very fine powder in a mortar, and repeatedly digested, for several hours together, in boiling water; care being taken to reduce the compound to a still more minute state of division, by pa-

* Organic Chemistry, part 2. chap. xiv. p. 358.

† Quart. Journal of the Chem. Soc. of London, No. xiv. p. 178.

‡ Ibid. No. ix. p. 14.

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tient trituration in a mortar, after each digestion, &c. The washings, on being treated by Reinsch's process, were found to contain a large proportion of arsenious acid.

The insoluble residue having been digested in water for 12 or 15 hours, as before described, was dried and weighed. It amounted to about 29 grs.* It was then boiled in strong hydrochloric acid, when it dissolved with the characteristic color of the proteine compounds. Upon testing this solution in the usual manner, only exceedingly minute traces of arsenic could be detected; a quantity insufficient to yield, on oxidation, a perceptible sublimate of arsenious acid.

Experiment II.—According to the authorities above referred to, 61·07 grms, of albumen will combine with 0·386 grm. of arsenious acid=0·632 per cent. If this statement be correct, I argued, of course if I make a mixture of these two substances, so arranging my experiment that the arsenious acid shall not be present in such large quantity, or in other words, if I employ an excess of albumen, and evaporate the compound to dryness, no trace of arsenious acid ought to be extracted from the mass upon subsequent digestion in boiling water. 438·5 grs. of glairy albumen were therefore mixed with an aqueous solution of arsenious acid containing 0·25 gr. of AsO^3. The mixture was evaporated to dryness in a gas-oven, and the brittle residue thus obtained treated as in the preceding experiment. The washings, when tested by Reinsch's process, gave evident tokens of the presence of a large quantity of arsenic. The insoluble residue, however, when decomposed in the usual manner by sulphuric acid and heat and afterwards introduced into Marsh's apparatus, gave but very faint stains of metallic arsenic.

Experiments III., IV. and V.—The same experiments repeated, different proportions of arsenious acid and albumen only being employed. Similar results were obtained.

Experiment VI.—Experiment II. repeated, the same quantities of arsenious acid and albumen being used. Instead of evaporating the mixture to dryness, however as before, it was merely heated to the boiling point and then filtered, in order to separate the coagulum which was formed. This latter was then divided into two portions; one of these was treated by Reinsch's process, and found to contain sensible quantities of arsenic, as did also the liquid from which the coagulate had been separated, in either case bright steel-gray stains being formed upon the copper; the other half on the contrary, was triturated for several minutes in a mortar with about twice its weight of pure quartzose sand, afterwards boiled in water, and treated as in the former experiments. Upon subsequently testing it by Reinsch's process, only very faint and doubtful traces of arsenic were discovered.

Experiment VII.—483 grs. of albumen were mixed with 3·0 grs. of dissolved arsenious acid. The mixture was then coagulated by heat and treated as before. The washings having been carefully collected and evaporated to dryness left a yellowish residue, which was redissolved in boiling water. The latter solution was filtered, in order to remove some few flocculi of albumen which had passed through the pores of the muslin strainer; it was then acidulated with hydrochloric acid, and treated with sulphuretted hydrogen, a stream of which was passed through it for some time, until the liquid smelt strongly of the gas. The solution was boiled in order to dispel the excess of hydrosulphuric acid, and the precipitate of tersulphide of arsenic formed separated by filtration. When dried at 212°F. it was found to weigh 3·63=2·921 grs. AsO^3

Experiment VIII.—This was undertaken with the view of ascertaining whether arsenious acid really loses its poisonous properties on admixture with albumen, as has been asserted.

The whites of three eggs, weighing altogether 1624 grs., were mixed with water and 6·5 grs. of dissolved arsenious acid. The mixture, having been evaporated to dryness was finally commuted, mixed with food, and administered to a cat. Having eaten about a fifth or a quarter of the powder the animal refused to take the remainder; in a short time it exhibited considerable uneasiness, vomited repeatedly, and was soon after attacked with all the symptons of arsenical poisoning. It lingered on however, in a state of extreme torment, for two or three days, and refusing food to the last. No *post-mortem* examination of the body was made; my time being then much occupied with matters of importance.

As regards the above results, it is in my opinion quite unnecessary to offer any observations upon them, as they may be said to speak for themselves. I shall therefore content myself with relating the facts I have observed, and leave my readers to draw their own conclusions.—*Philosophical Mag.*

Mansion House, Old Park, Bristol,
May 16th. 1851.

* It must be understood, however, that this quantity does not represent the whole of the albumen contained in the white of egg employed; a portion was undoubtedly lost during the long-continued washing.

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ON A NEW MODE OF SEPARATING PHOSPHORIC ACID FROM THE METALLIC OXIDES.

BY SENOR ALVARO REYNOSO.

Owing to the great analogy which exists between the chemical properties of the oxides and those of the phosphates of which they form part, a sure and rapid mode of effecting their separation has not hitherto been arrived at. The various processes proposed by MM. Berzelius, Otto, Fresenius and H. Rose, do not always enable us to obtain a complete isolation of these substances; a portion of the phosphoric acid remains in the precipitate retained by the oxides. It was important to find a process of estimating this acid, especially with a view to the analysis of soils and of the ashes of plants whose composition is so interesting in an agricultural point of view. The process which I am about to describe will effect this separation.

This process is based on the observation which we have made on the insolubility of phosphate of binoxide of tin in nitric acid whilst all the other phosphates are soluble in it. The following is the mode of operating: pure tin is taken (commercial tin may also be employed, but then it is necessary to determine beforehand the quantity of stannic acid which it will produce); this tin is weighed, and it is introduced with the phosphate into a small flask; an excess of nitric acid is added and it is boiled. When all the tin has been acted upon, the solution is filtered and the precipitate is washed and heated to redness over a spirit-lamp: it is then weighed; from its weight is deducted that of the stannic acid produced by the tin employed: the excess of weight gives the quantity of phosphoric acid. It is necessary, however, to take some precautions which, if neglected, would produce a loss or an excess.

1. We must guard against reducing circumstances when we burn the precipitate; without that, the stannic acid would be decomposed, and there would be a loss. For that purpose, it is sufficient, in burning the filter, to add a few drops of nitric acid, and especially, if it be burned over a lamp with a double current, to avoid the flame rising above the edges of the capsule. If the flame rises, reduction will take place; by adding nitric acid, this inconvenience will, it is true, disappear, but then we are exposed to projections. In all cases, it will be ascertained whether or not any reduction has taken place, by examining the color of the precipitate, which should be of a straw color; if it is brownish, this is a proof of reduction.

2. The compound which phosphoric acid forms with binoxide of tin absorbing aqueous vapor very easily, the precipitate must be weighed immediately after it has been calcined and while still hot; without this precaution, there would be an increase in the actual quantity of phosphoric acid.

The value of this process may easily be appreciated by putting phosphate of soda into a flask with an excess of tin; this is boiled with nitric acid diluted with its own bulk of water, and chloride of calcium produces no precipitate in the liquor saturated by ammonia.

We shall determine in our memoir the maximum of phosphoric acid absorbed by a given weight of tin.

The following are some analyses which we have made by this process:—

		Employed.
		gr.
Pyrophosphate of soda.....		0·367
Tin		1·000
	Calculated.	Found.
Phosphoric acid....	0·196	0·180
Stannic acid	1·272	1·272
	1·468	1·452

		Employed.
Pyrophosphate of soda.....		0·361
Tin		1·164
	Calculated.	Found.
Phosphoric acid....	0·194	0·182
Stannic acid	1·480	1·480
	1·674	1·662

		Employed.
Pyrophosphate of soda.....		0·200
Tin		1·000
	Calculated.	Found.
Phosphoric acid....	0·107	0·106
Stannic acid	1·272	1·272
	1·379	1·378

We shall shortly have the honor of presenting to the Academy a series of experiments on the action of water, under high pressure, on the pyrophosphates. All the pyrophosphates capable of forming insoluble phosphates have the property, when subjected to this action of being divided into acid phosphates which remain in the liquor and into insoluble tribasic phosphates which remain precipitated.

The action is very clear and striking as regards the pyrophosphate of silver, seeing that the tribasic phosphate is yellow. In the liquor, are discovered all the characters of the salts of silver and phosphates. The pyrophosphate of lime is also very clearly divided. We shall hereafter give these experiments in detail.—*Comptes Rendus*, No. 14, October 6, 1851.

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ON SOME PRODUCTS OF THE ACTION OF NITRIC ACID ON CITRACONIC ACID.

BY M. SAMUEL BAUP, CHEMIST AT LAUSANNE.

PROFESSOR GOTTLIEB has just published a primary memoir on the isomeric acids, in which he describes a new acid, formed by the reaction of very weak nitric acid on citraconic acid; concentrated nitric acid gave him several other products which he promises to make known at a future period.

Having, some time since, been occupied in the examination of the action of nitric acid on several organic acids, I found that when diluted with four times its weight of water, nitric acid transformed citraconic acid into a new acid, isomeric with this latter; but that, when concentrated, it had a very powerful action on citraconic acid, and that it then gave, amongst other products, an oleaginous liquid, from which I extracted two bodies, which appeared to me new, and which I had begun to study, when want of material and time obliged me to suspend my researches. The work of M. Gottlieb having in the meantime appeared, I considered that I ought not to resume mine, but should merely extract from my former observations those yet unpublished, and give them here as a contribution or simply as a continuation of his work.

M. Gottlieb has assigned the following properties to the new acid: it is sparingly soluble in cold water, but very soluble in warm; it crystallises in fine needles; is soluble in alcohol; fusible at 406° F, into a colorless liquid; it sublimes at some degrees beyond that without decomposition; after having been melted, it takes, on cooling, a crystalline texture; its vapor is pungent, and causes coughing; its composition is that of citraconic acid. The only combination of this acid of which he gives the analysis, the salt of silver, corroborates this view.

To the above properties I add the following. This acid, which I have named *citracartic*,* is soluble in 38 parts of water at 57° F, and in 29 only at 71° F. At this last temperature it dissolves in 2·6 parts of alcohol of 88 per cent. It is also soluble in sulphuric ether. By crystallisation in alcohol, it is obtained in transparent compressed prisms.

It will likewise sublime without fusing. Heated in a platinum spoon and lighted, it burns with a blue flame, without leaving any carbonaceous traces.

The solution of citracartic acid gives a white precipitate with sub-acetute of lead and nitrate of mercury; reddish flakes with chloride of iron. Acetate of lead produces an instantaneous crystallisation.

The solution of citracartate is precipitated by nitrate of silver, sulphate of copper and chloride of mercury.

Citracartic acid being isomeric with citraconic acid, is so consequently with itaconic acid (citricic) and with lipic acid.

The following are some of the combinations of this acid which I have examined:

Citracartate of potassa.—The neutral salt is very deliquescent. The bisalt crystallises in small micaceous plates; soluble in various proportions of water, sparingly soluble in alcohol.

Citracartate of soda.—The neutral salt has not been obtained in crystals. The bisalt crystallises in small rhomboidal prisms, unalterable in the air.

Citracartate of ammonia.—The neutral salt is uncrystallisable. The bisalt is in very small prisms terminating in a point with three facettes; soluble in 8 parts of water at 61° F. By neutralisation, I obtained the numbers 146·3 and 145 as its equivalent.

The composition of this bisalt may be established as follows:

1 equiv. ammonia	17	11·56
2 equiv. acid	112	76·19
3 equiv. water.....	18	12·25
	147	100·00

Citracartate of baryta.—The neutral salt is in prismatic, transparent, quadrangular crystals, unalterable in the air; but when very dry, or when exposed to slight heat, they effloresce; they reacquire in the open air their water of crystallisation. In decomposing it by heat, it swells to nearly five times its original bulk.

2·411 gr. of this salt lost by dessiccation 0·508 of water or 21·07 per cent., and by calcination gave 1·407 of carbonate of baryta or 44·35 per cent. of baryta.

2·259 gr. of this salt lost 0·482 of water or 21·34 per cent., and gave 1·320 of carbonate or 45·39 per cent. of baryta.

2·134 gr. of this salt lost 0·451 of water or 21·13 per cent., and left 1·248 of carbonate or 45·43 per cent. of baryta.

The calculated composition of this neutral salt is therefore:

1 equiv. baryta	76·6	45·44
1 equiv. acid	56·0	33·21
4 equiv. water	36·0	21·35
	168·6	100·00

* From *citraconic* and *ars, artis* (as in the word *aspartic*). M. Gottlieb calls it *mesaconic;* I have here preserved the name *citracartic,* which denotes its origin and mode of production.

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Bicitracartate of baryta is in small crystals unalterable by the air.

1·448gr. of this bisalt gave by calcination 0·683 of carbonate of baryta, or 36·64 per cent. of baryta.

1·347gr. of this bisalt gave 0·638 of carbonate, or 36·79 per cent. of baryta.

According to this calculation:

1 equiv. baryta.....	76·6	37·07
2 equiv. acid	112·0	54·21
2 equiv. water	18·0	8·72
	206·6	100·00

Citracartate of Calcium.—In very small acicular crystals, forming when united, white, fibrous crusts; soluble in 16½ parts of water at 68° F.; insoluble in alcohol.

It loses its water of crystallisation only at a rather high temperature, and reacquires it from the air. When decomposed by heat it swells less than the salt of baryta.

1·009gr. of salt calcined at a white heat gave 0·304 of lime, or 30·13 per cent.

Its calculated composition is:

1 equiv. lime.....	28	30·11
1 equiv. acid.....	56	60·21
1 equiv. water	9	9·68
	93	100·00

Citracartate of lead.—A neutral salt, obtained by mixing the solution of a neutral citracartate with acetate of lead; the white curdy precipitate which appears at first changes by degrees into small crystals. If the solution is very diluted the salt deposits slowly in very small transparent crystals, which are short compressed prisms.

0·922gr. of dry salt gave after calcination a residue weighing 0·579 containing 0·485 of metallic lead; therefore 0·61623 of oxide of lead, or 66·83 per cent.

1·141gr. of the same salt left a residue of 0·723 containing 0·486 of metal; therefore 0·76031 of oxide, or 66·63 per cent.

The water driven off by dessication was from 7·9 to 8·2 per cent.; but, as the number of equivalents is fractional, and as it is possible that the salt might have been sublimed, I shall only give the composition of the anhydrous or dried salt:

1 equiv. oxide of lead..	112	66·67
1 equiv. acid	56	33·33
	168	100·00

The *bisalt*, is prepared by the addition of acetate of lead to citracartic acid; according to the state of dilution or concentration of the liquors, it is deposited more or less quickly in small prismatic crystals, terminated at each end by a point. Exposed to heat, it swells and decomposes, which is not the case with the neutral salt.

1 gramme of this bisalt left by calcination a residue weighing 0·457, of which 0·246 was metal or 0·4790 of oxide or 47·90 per cent.

1 equiv. oxide of lead..	112	48·07
2 equiv. acid	112	48·07
1 equiv. water	9	3·86
	233	100·00

Basic salt.—Tribasic acetate of lead, poured into a solution of a neutral citracartate, produces in it a flocculent or pulverlent precipitate which, after some time, diminishes considerably in volume. This basic salt loses about 6 per cent. by dessication before turning yellow.

1 gramme of this salt gave a residue of 0·678 of which 0·592 was metal, or 0·7235 gr. of oxide or 72·35 per cent.

According to this single experiment, this salt might be considered as containing 2 equivalents of oxide of lead and 3 of water to 1 of acid, and may be regarded as citracartate of lead.

Citracartate of copper.—By mixing a solution of acetate of copper and citracartic acid; according to the state of concentration it deposits, more or less quickly, very small granular crystals of a deep sky blue: it is the neutral salt.

1 gramme of this salt, dried in the open air, gave by calcination 0·348 of oxide of copper, or 34·80 per cent.

0·528 gr. of the same salt lost by dessication 0·082 of water, or 15·53 per cent, and left after calcination 0·182 of oxide of copper, or 35·03 per cent.

The following may be considered as the composition of this salt

1 equiv. oxide of copper .	40	35·09
1 epuiv. acid.	56	49·11
2 equiv. water.	18	15·79
	114	100·00

By the decomposition of a neutral citracartate, by means of acetate or sulphate of copper, there is obtained, coincidently with the above mentioned neutral salt, a basic salt, of a pale verdigris color, very effervescent in the air.

The oleaginous product obtained by the action of concentrated nitric acid on citraconic acid, which I have before mentioned, is transformed, by cooling, into a yellowish crystalline mass, which, when boiled with water, diffuses an aromatic odor approaching to that of mint, and gives a sweet flavor to the liquid.

After prolonged boiling in fresh water, this crystalline mass was treated, while hot, with alcohol at 88 per cent, which gave, on cooling, two white crystalline substances, whose different solubility enabled me to se-

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parate them. I shall distinguish them provisionally by the adjective names *eulyte* and *dyslyte* (easily and difficultly soluble.) These nitrous substances are white or colorless, without odor or savor.

The *eulyte matter* crystallises in alcohol in white striated prisms, with a satiny lustre; in sulphuric ether it is deposited in small transparent very brilliant crystals. It dissolves very readily in hot alcohol at 88 per cent; at 50°F, it requires 170 parts to retain it in solution. Water, at the same temperature, will only dissolve one ten-thousandth part of its weight. When thrown into boiling water, it melts into transparent globules; if, after cooling, the globules remain soft and transparent, a touch is sufficient to render them immediately opaque and hard. After melting, the eulyte matter concretes, by cooling, into a lamellar crystalline mass: a property which it loses if the action of heat is prolonged. By augmenting the heat, it volatilises entirely, diffusing an odor analogous to amyrine. If heated in a tube, red nitrous vapors appear; when lighted, it burns with a flame. Concentrated sulphuric acid dissolves it with the aid of heat; the greater part crystallises on cooling.

The *dyslyte matter* crystallises in alcohol in fine, brilliant, transparent needles, very fragile prisms with four sides. The solution in sulphuric ether crystallises in needles. At 50° F, it requires nearly 2200 parts of alcohol at 88 per cent, to dissolve one of the dyslyte matter, and only 1500 parts of alcohol at 97 per cent, at the same temperature. It may be said to be insoluble in water, because, at 50° F, it requires 24,000 parts to dissolve it. It does not melt in boiling water; however, after the water has cooled, a slight deposit of very small acicular crystals is perceptible with the aid of a magnifier. Melting into a colorless liquid, it is transformed, on cooling, into brilliant prisms, even when the fusion has been very prolonged. It volatilises entirely in small transparent crystals, diffusing a peculiar odor, resembling that of cummin or mint. It dissolves also in sulphuric acid.—*Annales de Chimie et de Physique*, October, 1851.

ON THE PRODUCTS OF THE OXIDATION OF THEOBROMINE, AND ON THE COMPOSITION OF THE RUBIACEÆ.

BY PROFESSOR ROCHLEDER.

Dr. Hlasiwetz and myself have for some time past been occupied in examining the products of the oxidation of theobromine. When oxidised with a Grove's battery of nine elements, a substance is obtained which may be represented by the formula $C^{12} H^8 N^2 O^{16}$; and when treated with peroxide of lead and sulphuric acid, the product is an amorphous substance, with the formula $C^{12} H^{13} N^3 O^{12}$. Chloride of platinum produces in its solution a copious precipitate of ammonio-chloride of platinum. By deducting 1 equivalent of NH^3, HO, there remains $C^{12} H^9 N^2 O^{11} = C^4 H^4$, $C^8 N^2 H^5 O^{11}$; but the formula $C^8 N^2 H^5 O^{11} = C^8 H^4 N^2 O^{10}$ (alloxan) + H O. The substance filtered from the ammonio-chloride of platinum crystallises, but we have not yet obtained sufficient for analysis. The substance $C^{12} H^{13} N^3 O^{12}$ may be decomposed into $C^{12} H^8 N^2 O^{10} + NH^4 O + HO$, and would then be a compound of oxide of ammonium (with one equivalent of water) with an acid, $C^{12} H^8 N^2 O^{10}$ that is with inosinic acid + $C^2 H^2$*

The researches with which we are now occupied will show which expression is most correct.

The examination of the different plants included in the family of *Rubiaceæ*, has, in my opinion, acquainted us with an interesting law in the composition of the following members of this natural family,—

Cephaëlis Ipecacuhana, *Coffea Arabica*, *Chiococca racemosa*, *Cosmibuena (China nova) China regia*, *Asperula odorata*, *Rubia tinctorum*, *Galium verum*, and *Aparine* and *Richardsonia scabra*.

There is, in all these plants, an acid, resembling in some respects tannic acid, and containing 8 equivs. of hydrogen to 14 of carbon, with a variable proportion of oxygen, its formula being $C^{14} H^8 O^n$ A second series of acids, whose general formula is likewise $C^{14} H^8 O^n$ is united to the first series; the substances belonging to which have nothing in common with the series of tannic acids; nevertheless they agree in this, that in certain circumstances 2 equivs. of carbon separate as some compound, so that the formula $C^{14} H^8 O^n$ must be written $C^{12} + {}^2 H^8 O^n$

Of the 8 equivs. of hydrogen, 2 equivs. generally separate with the 2 equivs. of

* $C^8 N^2 H^4 O^{10}$ = alloxan
$C^{10} N^2 H^6 O^{10}$ = inosinic acid
$C^{12} N^2 H^8 O^{10}$ = the acid of the ammonia salt prepared from theobromine by SO^3 and $Pb O^2$.

This would be a series of alloxan + n ($C^2 H^2$), in the same way as alloxantine and amalic acid form a series of alloxantine + n ($C^2 H^2$).

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carbon, and the formula $C^{14} H^8 O^n$ becomes

$$\left.\begin{matrix} C^{12} H^6 \\ C^2 H^2 \end{matrix}\right\} O^n$$

A third series comprises the substances containing 12 equivs. of carbon, such as citric acid, kinovic acid, the red coloring substance of *China nova*, &c. These substances shew the remarkable characteristic that the sum of the equivalents of oxygen and hydrogen in these bodies (the acids considered as hydrates) is either equal to the number 11, or, in the case of citric acid, 2×11, or 22, and in some few cases $= 12$. A fourth series, which is not represented in all the plants of the family, is the series of substances with C^{20} to which quinine, cinchonine, alizarine, &c., belong.

Although the similarity of form rendered a similarity of composition highly probable, I cannot think it useless to have proved it by analysis. As, in the mineral kingdom, the garnets, felspars, and alums, form natural families, one constituent being replaced by an equivalent amount of a very similar one; for instance, potassa by soda, peroxide of iron by alumina or oxide of chromium; so, in the families of the vegetable kingdom, there seems to occur a substitution of one acid by another very similar in properties and composition.—*Liebig's Annalen, July*, 1851.

MEMOIR ON THE PHYSIOLOGICAL STATE OF ALBUMEN IN THE ECONOMY.

BY MM. MIALHE AND PRESSAT.

We have proved in former researches, that no substance can enter into the economy or leave it, without being in a state of solution which gives it the property of moistening, penetrating, and traversing the membranes, and arriving in the interior of the tissues, to be there, according to its ultimate destination, assimilated, destroyed, or burned, in order to aid in the formation of the organs or to pass out *via* the secretions. This is a general law which admits of no exception.

However, there is a substance which alone seems to escape this law; this is albumen. Hitherto regarded as soluble, because it presents all the appearances of ordinary liquids, it would offer this singular anomaly of acting like an insoluble body. In the normal state of health, it is never found in the excretions; if albumen is maintained in the circulatory current, in the interior of the vessels which contain it, when every soluble body must necessarily obey the laws of endosmose, traverse the membranes, and be diffused throughout the organism, it is because it possesses the properties of insoluble bodies. The albuminous liquids are thus found in different conditions from ordinary aqueous liquids.

We propose to demonstrate that, contrary to the general opinion, albumen is insoluble; that, to penetrate into the economy and leave it, it must undergo transformations, which render it soluble; that, so far from constituting an exception to the natural laws, the insolubility of albumen is the very consequence of its organisation, and the essential condition of the functions which it is destined to fulfil.

In the normal physiological state, albumen does not traverse the membranes. If, during the endosmotic experiments, a certain quantity of albumen be found in the exterior liquids, it is not normal albumen, but modified albumen, arising from the maceration of the membranes themselves, which have allowed the albuminous matter with which they are impregnated to transude: a cause of error which has led most physiologists to regard albumen as endosmotic, an error which may easily be avoided by placing animal membranes in a preserving liquid, such as sugar syrup, or by employing the membranes of the egg, which resist maceration for a long time, and are perfect endosmometers; thus serum and white of egg, whose chemical composition and physical properties are similar, never traverse the membranes. Albumen is therefore insoluble and not endosmotic.

This state of insolubility must be accompanied by an organisation similar to that of other substances which do not obey the laws of endosmose, fibrine, caseine, and cruor in animals, and starch and gluten in vegetables; substances of globular organisation and suspended in liquids which serve as their vehicle. The globular state noticed by some authors cannot be directly perceived with the microscope, it is questionable with baryta water; notwithstanding the analogies which we construct to admit it, we do not consider it sufficiently demonstrated. But albumen certainly has a special organisation which maintains it in the state of suspension and not of solution in serum and white of egg, and which renders it in physical and chemical properties perfectly similar to globular substances.

Like globular substances, in order to penetrate into the economy, it must un-

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dergo modifications which render it soluble and capable of being assimilated; and our experiments prove that if normal albumen is insoluble, and not endosmotic, albumen modified by a ferment (pepsine) becomes soluble and traverses the membranes perfectly.

To become albuminose, the ultimate product of its transformation, albumen undergoes successive modifications, and it is thus that it exists in the economy in three states very distinct in physical and chemical properties.

1. Normal, physiological albumen constituting one of the principal elements of the blood; identical with the albumen of white of egg, insoluble, incapable of traversing the membranes, precipitable by heat and by nitric acid, and insoluble in an excess of acid.

2. Amorphous caseiform albumen, resulting from the first modification of the albuminous aliments under the influence of the gastric juices, a product of transition destined to be converted into albuminose; it is capable of traversing the membranes, but incapable of being assimilated; it is imperfectly precipitated by heat and nitric acid, an excess of which dissolves the precipitate. In proportion as it is modified, amorphous albumen resembles albuminose, of which it assumes the characters and properties.

3. Albuminose, the ultimate product of the transformation of the albuminoid aliments by the act of digestion, is soluble, endosmotic, and assimilable, and is conveyed by all the apparatus of secretion and organic composition; it is met with in all the animal humors, the blood, milk, saliva, perspiration and urine, but in scarcely appreciable quantity; it furnishes the principal elements of nutrition; it is not precipitated either by heat or by nitric acid, but only the reagents which detect all animal matters.

These three states of albumen constitute one and the same substance which, in being modified, acquires new properties. They are chemically isomeric, and the most careful analysis cannot detect the slightest difference in their elementary composition. Although retaining their common character of being precipitated by the salts of lead, silver and mercury, creosote, tannin, alcohol, &c., they are perfectly distinguished from each other by the manner in which they act with heat and nitric acid.

The morbid influences, in modifying the conditions of the physiological state of the membranes and liquids of the economy, give rise to different phenomena from those which occur in the normal state: in consequence of inflammations, of excess of aqueous principles, of deficient viscidness, of the introduction into the organism of virus, miasmata, poisons, putrid ferments, &c., the membranes cease to be endosmotic; the blood and its elements, modified in their composition, transude through the sides and are lost in the excretions.

The passage of albuminous matters into the urine constitutes a pathological state long regarded as the result of a special affection of the kidneys; however the English authors, to whom we owe the first researches on this curious disease, have for the most part abandoned the idea that it is always connected with an organic lesion. It is now known that the urine may contain albuminous matters in certain dropsical disorders, affections of the heart, after diseases of the skin, &c., the kidneys remaining free from alteration.

In the urine are found all the three states in which albumen exists in the economy, but each connected with different pathological causes, normal albumen, connected with profound alteration of the renal glands; amorphous albumen with vitiation of the liquids; and albuminose, with absence of assimilation, or with the choleraic influence.

It is the amorphous, caseiform albumen, which, by its presence in the urine constitutes the true Bright's disease, and it is constantly connected with alteration of the liquids of the economy. Is this alteration the cause or the effect of albuminous urine, and of the material disorders which may exist in the renal glands?

We think that we may conclude from the facts contained in our work that the general alteration of the liquids of the economy precedes and determines the passage of albumen into the urine, and that the constant fluidification of the albumen produces in its turn the modification of the tissues, and, gradually, the alterations of which the kidney becomes the seat. This vitiation of the humors may be determined by various causes, all of which have the result of accumulating an excess of aqueous principles; it may be connected with organic alterations which render its cure more or less possible. In all these cases, the urine loses its specific gravity; it precipitates imperfectly by heat and by nitre, acid, an excess of which redissolves the precipitate; these characters denote amorphous caseiform albumen; thus Bright's disease might be called caseinuria, whilst the urine coagulating by heat and forming with nitric acid, an insoluble precipitate,

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contains normal albumen, unmodified and constitutes the true albuminuria, which is invariably connected with disorganisation of the renal glands.

As to the passage of albuminose into the dejections, it is most ordinarily determined by the choleraic affection. When the albuminose expelled is not the product of the conversion of the albuminoïd aliments by the act of digestion, it is the product of the transformation of the albuminous principles of the blood and of the various tissues by the influence (probably fermentative) of the virus which constitutes cholera. In the choleraic dejections, no normal albumen exists, that which is found is albumen modified to all the degrees according to the disorganising influence, so that the morbid ferment and the digestive ferment exert the same action on the albuminous matters, the one to make them penetrate into the economy, the other to expel them.—*Comptes Rendus*, No. 17, Oct. 27, 1851.

ON THE PRESENCE OF PROPYLAMINE IN THE CHENOPODIUM VULVARIA.

BY M. DESSAIGNES.

M.M. Lassaigne and Chevallier, in a work published some time since, mentioned the presence of carbonate of ammonia in a living plant, the *Chenopodium vulvaria*. The anology between the odor of this plant and that of one of the ammoniacal bases of the series discovered by MM. Wurtz, Anderson and Wertheim, I mean propylamine, led me two years ago to suspect that this alkali might be found in the *Chenopodium vularia*. I have this year been able to collect a sufficient quantity of this plant to submit my conjectures to the test of experiment

I distilled about 40 kilogrammes of vulvaria in an alembic at different operations, sometimes with a weak solution of caustic potassa, sometimes with a solution of carbonate of soda. The product of this distillation saturated with hydrochloric acid was evaporated to dryness, then treated with concentrated alcohol which left undissolved a large quantity of sal ammoniac. The alcoholic solution was precipitated by chloride of platinum. The precipitate, washed in alcohol and dissolved in a little warm water, formed, on cooling, large orange red crystals of a double salt of platinum and an organic base, which renewed crystallisations purified from a small quantity of chloroplatinate of ammonia which they still contained.

Another method may be employed for obtaining a salt of this base free from ammonia; it consists in precipitating the impure hydrochlorate by chloride of gold, and redissolving the precipitate in warm water which on cooling abandons a beautiful orange yellow double salt, sparingly soluble in cold water and forming feather shaped crystals like sal ammoniac.

The hydrochlorate of this alkali is deliquescent; nevertheless when powerfully concentrated it crystallises in long prisms; it likewise crystallises by sublimation. Its aqueous solution, mixed with potassa, disengages an ammoniacal odor and at the same time an odor of cooked cod or crab. It has the same taste as brine that has been used for salting cod.

I have submitted the pure double salt of platinum to the following analyses.

1st 0·451 gr. when calcined gave 0·167 gr. of platinum.

2nd 0·593 gr. burnt with oxide of copper gave 0·304 gr. of carbonic acid and 0·210 of water

3rd 0·454·5 gr. calcined with soda lime produced a quantity of ammonia representing 0·023·5 of nitrogen.

4th 0·395 gr. calcined with lime gave 0·647 gr. of chloride of silver.

These numbers agree well with the composition of the chloroplatinate of propylamine, and give in hundredths,

	Experiment.		Calculation.
C	13·93	C^6	13·57
H	3·91	H^{20}	3 77
N	5·10	N^2	5·28
Cl	40·50	Cl^6	40·17
Pt	37·02	Pt	37·19

Moreover 0·328 gr. of the double salt of gold, gave 0·162 gr. of gold, or 49·39 per cent; calculation indicates 49·62.

Propylamine, consequently, exists ready formed in a living vegetable at the same time as ammonia, as I proved by its easy disengagement on the distillation of *Chenopodium vulvaria* with a dilute solution of carbonate of soda. Its presence in this plant is coincident with a great quantity of a proteïc matter coagulable by heat.—*Comptes Rendus* No 13 Sept. 29. 1851.

CONTRIBUTIONS TO THE HISTORY OF MANGANESE.

BY M. J. LEFORT.

The combinations which the sesquioxide and the binoxide of manganese form are but little known. Perhaps this is owing to the difficulties which the preparation of these oxides in a state of purity and in sufficient quantity presents.

The separation of manganese from metals

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which, like iron, closely resemble it, is very difficult.

The object of this note is to make known the prompt and at the same time certain means which I employ for obtaining the manganese in a state of absolute purity.

This process is based on the property which the chlorides of oxides possess of peroxiding the protosalts of manganese. M. Millon was, as is known, the first who pointed out this reaction as capable of dictating hypochlorous acid in an aqueous solution of chlorine. (See THE CHEMIST New Series, Vol. II. 1850-51, page 11.)

The protochloride of manganese arising from the preparation of chlorine, or else the protosulphate, obtained by calcining peroxide of manganese with sulphate of iron is dissolved in a certain quantity of distilled water and submitted to a temperature of 86° to 104°F.

Into this liquor is poured chloride of oxide of sodium or potassium, until the precipitate which is formed changes no more in color.

When it is judged that all the protosalt of manganese is peroxidised, the liquid is decanted and the precipitate is washed with water acidulated with nitric acid. 1 part of acid in 50 parts of water, is sufficient to dissolve all the metals naturally contained in the manganese of commerce.

The oxide obtained is a deep brown anhydrous powder, but retains from 1 to 3 per cent of interposed water.

When the operation is well conducted all the manganese passes to the state of very pure binoxide.

Considered in an industrial point of view the process which I point out may be of some utility; I allude to the revivification of the manganese contained in the residues of the preparation of the decoloring and disinfecting hypochlorites.

It is known that M. Ebelmen (Payen, *Chimie Industrielle*, p. 186, 1849) has proposed, in order to make these residues useful to saturate them with one equivalent of hydrate of lime and to allow them to deposit. The liquid which contains the chloride of calcium is decanted, and the deposit, washed and kept moist, gradually absorbs oxygen from the atmosphere, and passes to the state of oxidation intermediate between the protoxide and the sesquioxide of manganese.

I should therefore recommend the addition to the hydrate of lime of a certain quantity of chloride of lime which would cause the manganese in a few hours to pass to the state of binoxide.

The expense occasioned by the addition of chloride of lime, the cost of making which is so small, would be amply compensated both by the time and by the production of chlorine.—*Journal de Pharmacie October* 1851.

ON THE PRODUCTION OF CYANOGEN BY THE NITROGEN OF THE AIR.

BY M. H. RIEKEN.

THE presence of cyanide of potassium has often been observed in the high furnaces, and, to explain the formation of cyanogen in this case, it has been supposed that at a very high temperature and in presence of potassa, the nitrogen of the air is capable of combining with carbon. However, the direct experiments made on this subject had not carried conviction to all minds, and this important question has received in some measure only a practical solution by the establishment, in England, of a large manufactory of prussiate of potash, founded on the formation of cyanogen at the expense of the nitrogen of the atmosphere. Doubt could no longer exist in the face of the results obtained in England. But, as in this case, practice was in advance of theory, it appeared interesting to the author to make new experiments on this subject, in order to perfectly establish the theoretical conditions of the phenomena in question. Messrs. Bunsen and Playfair in their work on the processes of manufacturing iron in England, have already demonstrated, by positive experiments, that cyanogen may be formed directly; but the result of their experiments having passed unnoticed, M. Rieken has thought it right to point out his own in a succinct manner.

He has proved that carbonate of potassa intimately mixed with charcoal, and calcined in a very hot current of nitrogen gas, at the temperature at which the potassium is reduced, is completely converted into cyanide of potassium. In one of the experiments made by the author, the conversion was so complete, that the solution of the cyanide formed produced no effervescence with the acids. Moreover, no precaution was omitted to guard against causes of error resulting from the presence of nitrogen in the charcoal, or of ammonia in the nitrogen, employed. The charcoal used was prepared by the calcination of the purest sugar, and the potassa by the decomposition of the crystallised bicarbonate. The nitrogen was obtained by passing atmospheric air first into sulphuric acid, then into a tube containing chloride of cal-

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cium, and finally, into a gun barrel, containing iron turnings. The pure nitrogen passed directly into the porcelain or cast iron tube, containing the mixture of carbonate of potassa and charcoal. This tube was heated to whiteness in a long furnace, with the aid of a forge. This high temperature, and the incandescence of the nitrogen gas itself, are two conditions necessary to the formation of cyanogen. Without the forge, and with cold gas, M. Rieken did not obtain a trace of cyanide of potassium. The free potassium does not determine the formation of cyanogen at the temperature at which it volatilises, that is to say, at redness. The author having passed a current of nitrogen through a mixture of charcoal and potassium, or charcoal and antimoniuret of potassium heated to redness, did not detect the formation of a trace of cyanide of potassium.—*Annalen der Chemie und Pharmacie.*

ON THE ESTIMATION OF PHOSPHORUS IN METALLIC IRON AND IN IRON ORES.

BY M. ULLGREN.

M. ULLGREN points out, for the estimation of phosphorus in iron and its ores, two methods, by means of which more satisfactory results are obtained, than by employing the known processes of H. Rose and Fresenius.

The first method is as follows. The solution of iron in nitric acid is mixed with hydrochloric acid, and evaporated on the sand-bath, to a syrupy consistence. The residue is diluted with water, and the liquor is poured drop by drop into a solution of monosulphuret of potassium and silicate of potassa. To a gramme of iron should be employed 5 grammes of sulphuret of potassium, and 1 gramme of soluble glass, prepared by fusing 1 part of powdered quartz, with 2½ parts of a mixture of 5 parts of carbonate of potassa and 4 parts of carbonate of soda. The precipitate which is formed, contains iron, in the state of sulphuret, and lime, magnesia, and alumina, in the state of silicates. The filtered liquor passes through at first limpid, but gradually becomes green by dissolving a small quantity of sulphurets. This effect is prevented by adding, before filtration, an excess of recently precipitated carbonate of lead. This salt decomposes the excess of alkaline sulphuret. The precipitate collected on the filter is washed with water, containing one-tenth of its bulk of a very concentrated solution of carbonate of ammonia, and a little caustic ammonia. The filtered liquor is evaporated almost to dryness, and the residue is moistened with hydrochloric acid, to separate the silica. The solution then contains all the phosphoric acid, and often traces of a metal resembling iron aridium.* To complete the precipitation of this metal, the author recommends mixing the solution with tartaric acid, and afterwards precipitating the phosphoric acid in the ordinary manner by means of sulphate of magnesia.

The second method, which is not so long as the first, is as follows:—

Concentrated solutions of 8 grammes of tartaric acid, and of 14 grammes of cyanide of potassium, are prepared, and on the other hand, 1 gramme of iron is dissolved in nitric acid, containing a little hydrochloric acid. The solution of tartaric acid is then mixed with the solution of iron, a certain quantity of sulphate of magnesia is added, the mixture is super-saturated with a considerable excess of ammonia, and, finally, the solution of cyanide of potassium is poured in. A liquor of a deep red color is thus obtained, and sulphuret of potassium is added, drop by drop, until the liquor, which first becomes of a light yellow, again acquires a deep tint: after some hours it then deposits a precipitate of ammoniaco-magnesian phosphate, mixed with a little sulphur. It is washed with ammoniacal water, and after being dried, it is heated in order to drive off the sulphur, then it is fused in a platinum crucible, with a mixture of carbonate of potassa and carbonate of soda. After having added tartaric acid and ammonia to the concentrated liquor, the phosphoric acid is precipitated by means of sulphate of magnesia.

This second method is based on the fact, that the ammoniaco-magnesian phosphate dissolves in small quantity in the ammoniacal solutions of tartrate of iron, whilst it is completely insoluble in ferrocyanide of potassium. The conversion of the salt of sesquioxide of iron into ferrocyanide of potasium, if effected with the aid of sulphuret of potassium, which, reducing the sesquioxide of iron in presence of the cyanide of potassium, gives rise to the formation of ferrocyanide of potassium.

This method is not applicable to the ores of iron containing lime. When it is required to be applied to such ores, the following modification is made. After having commenced the operation, as has just been directed, chloride of calcium is added to

* See THE CHEMIST, New Series, Vol. I., 1849-50, page 536.

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the solution, instead of sulphate of magnesia. The phosphoric acid combines with the lime. This base is precipitated by sulphuric acid and alcohol, and after having separated the gypsum by filtration, the operation is continued as above.—*Journal für Praktische Chemie.*

EXAMINATION OF AN ORE OF CINNABAR, FROM NEW ALMADEN, CALIFORNIA.

BY ADAM BEALEY, ESQ., M.A.

THIS ore has long been known to mineralogists as abundant and very accessible, but it had not attracted much notice until the recent development of the mineral wealth of California led to more extended inquiry into the actual extent of its distribution, and rendered improved methods of reducing it of great interest and value.

The mine, or principal deposit of this mineral, is thus described by Lyman in 1848 :*

"New Almaden lies between San Francisco and Montery, near the Coast. It is 1200 feet above the plain, and is situated upon a ridge of the Sierra Azul, which consists of a greenish talc-rock.

"The cinnabar is found in nests, in a stratum of a yellowish earth, which is 42 feet in thickness. The occurrence of this mineral has been known to the natives from time immemorial, as the cave of red earth, which they employed for painting their bodies.

"During Lyman's stay, the daily produce from 1,600 lbs. of cinnabar, distilled in a rudely constructed apparatus; was from 200 to 300 lbs. of mercury, and in the last three weeks of his residence the total amount of mercury obtained was about 10,000 lbs.

"Cinnabar had likewise been found in fifteen or twenty other places, within a circumference of a few miles."

A more recent account of this mine was politely communicated by Dr. Forbes, and accompanied a specimen of the ore sent to Professor Hofmann for analysis, at whose suggestion the following examination was undertaken :—

"The mine of New Almaden is situated in Upper California, near Santa Clara, on the coast, not far from San Francisco. It is the property of a company of English and Foreign merchants, and is leased to a company of the same kind.

"It has been in active operation for about six or eight months. The vein is very large, and 'crops out' on the surface, where it is worked. The metal is extracted from the ore in two ways:

"First, by a series of large iron cylinder-retorts, heated in furnaces, and discharging their produce into water, where the metal is condensed.

"Secondly, by brick furnaces, in which the fuel (wood) is intermixed with the ore. By these operations, the ore gives from 30 to 45 per cent. of its weight of mercury.

"The mine produced in the month of November, 1850, not less than 127,500 lbs. of mercury."

The ore as exhibited in the specimens sent, some of which weighed as much as 14 avoirdupois lbs., has a bright red color, slightly inclining to purple, and appears to have been imperfectly cleared from a soft, light-brown earth, which can easily be scraped from its surface. It breaks without much difficulty under the hammer, and is afterwards easily reduced to powder, with the exception of some bright crystalline particles, which are extremely hard.

The surfaces of recently broken ore appear much more purple than those long exposed. It is traversed at irregular intervals by very thin bands of white, hard, crystalline material, apparently calcareous and siliceous. When in the state of fine powder it has a very brilliant vermilion color, many shades darker than the massive ore. Its sp. gr. is 4.410.

In a preliminary examination, it exhibited the ordinary phenomena of a mercurial sulphide associated with siliceous matter. A portion of the ore was digested with nitro-hydrochloric acid, and the insoluble residue separated by filtration.

The solution examined by the usual methods contained mercury, sulphur, iron, alumina, a trace of nickel, lime, and magnesia.

The part insoluble in acid consisted of silicic acid, and very minute traces of lime and potassa.

In estimating the principal constituents of this ore, the mercury was determined as sulphide of mercury, and as metallic mercury by distillation with lime.

1. 2.238 grms. gave 1.801 grm. of sulphide of mercury.
2. 1.057 " " 0.860 " "
3. 250 grms. distilled with 500 grms. of

* Liebig and Kopp's *Annual Report*, by Hofmann and De La Rue. Vol. II., p. 388.

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lime, gave 175.540 grms. of metallic mercury.

The sulphur was estimated as sulphuric acid.

1. 1.349 grm. gave 1.120 grm. of sulphate of baryta.
2. 1.248 " " 1.025 " "

Iron as sesquioxide.

1. 1.940 grm. gave 0.024 grm. of sesquioxide of iron.
2. 1.610 " " 0.022 " "

Lime as carbonate of lime.

1.940 grm. gave 0.0485 grm. of carbonate of lime.

Alumina.

1.940 grm. gave 0.012 grm. of sesquioxide of aluminium.

Magnesia as pyrophosphate of magnesia.

1.940 grm. gave 0.0525 grm. of pyrophosphate of magnesia.

Insoluble residue.

1. 1.349 grm. of ore gave 0.193 grm. of silicic acid.
2. 2.238 " " " 0.325 grm. of silicic acid, and traces of lime and potassa too slight to be estimated.

The percentages corresponding to these numbers will be found in the table appended at the end of this note.

CINNABAR FROM ALMADEN, SPAIN.

As the appearance of an ore of cinnabar, so rich in mercury and found in such profuse abundance, seems likely to have a material influence upon the permanent supply ordinarily found in commerce, a comparison was instituted between this and the ore derived from Almaden, in Spain, well known as the chief source of Spanish mercury.

The specimen of ore examined was obtained from Mr. Tennant, and described as one from which a considerable part of Spanish mercury was derived. It is like the California ore, massive, but much less brilliant and much harder. Throughout its mass, small patches of yellow iron pyrites are irregularly distributed. When in the state of fine powder, it has a dull brick-red color, in striking contrast with the brilliant vermilion cinnabar from California. Its. sp. gr. is 3.622.

Submitted to the same examination, and treated similarly to the last, it exhibited the same phenomena, with variations too slight to require especial notice.

The part soluble in acid consisted chiefly of mercury, sulphur, iron, with traces of alumina, and lime; the part insoluble in acid, of silicic acid and alumina.

The principal constituents of the mineral were determined as before: mercury, as sulphide of mercury; iron, as sesquioxide of iron; sulphur as sulphuric acid; silicic acid as such.

Mercury.

1. 1.009 grm. of ore gave 0.443 grm. of sulphide of mercury.
2. 1.0205 " " 0.447 " "

Sulphur as sulphuric acid.

1.0205 grm. of ore gave 1.208 grm. of sulphate of baryta,

Iron.

1.009 grm. gave 0.148 grm. of sesquioxide of iron.

Insoluble residue.

1. 1.0205 grm. gave 0.357 grm. of silicic acid and alumina.
2. 1.009 " " 0.353 " "

I have moreover specimens of cinnabar ore from Moschellandsberg and from Wolfstein.

CINNABAR FROM MOSCHELLANDSBERG.

This specimen and the following one were obtained from Mr. Griffin, and described as being worked, though of comparatively rare occurrence.

The mineral is a dark, red-brown crystalline material, heavy, very hard, and with difficulty reduced to powder. Its sp. gr. is 4·735.

Examined and treated as the minerals previously mentioned, it was found to consist principally of mercury, sulphur, iron, alumina, and silicic acid. Mercury and sulphur only were determined quantitatively.

Mercury

1. 1·166 grm. of ore gave 0·902 grm. of sulphide of mercury.
2. 1.255 " " 0.967

Sulphur as sulphuric acid

1.3075 grm. gave 1·050 grm. of sulphate of baryta

Insoluble residue.

1.3075 grm. gave 0.2235 grm.

CINNABAR FROM WOLFSTEIN.

This ore is a grey earthy looking mineral, with dark livid patches occurring at intervals in its substance. It is very hard, and becomes a light puce-colored powder. It was found to consist of mercury, sulphur, alumina and a trace of iron, and silicic acid.

1.516 grm. yielded 0.316 grm. of sulphide of mercury.

From the above results the following percentages were calculated:—

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COMPOSITION OF VARIOUS CINNABAR ORES.

	Californian.				Almaden, Spain.			Moschellandsberg.			Wolfstein.
	1.	2.	3.	Mean.	1.	2.	Mean.	1.	2.	Mean.	
Mercury.....	69.36	70.13	70.23	69.90	37.84	37.75	37.79	66.60	67.13	66.86	18.00
Sulphur	11.38	11.21	—	11.29	16.22	—	16.22	11.01	—	11.43	
Iron.....	1.23	—	—	1.23	10.36	—	10.36	Insol. residue 17.09	—	17.09	73.31
Lime.....	1.40	—	—	1.40							
Alumina.....	0.61	—	—	0.61							
Magnesia....	0.49	—	—	0.49							
Silicic acid...	14.30	14.52		14.41	Silicic acid and alumina.....		3.512				
				99.33			99.49				

From these numbers it is evident that, provided the specimens represent the average minerals worked, the ore of California contains nearly double the amount of mercury found in the Almaden ore, and nearly fourfold that of the specimen of Wolfstein, while it approaches the composition of pure cinnibar, even more nearly than the mineral of Moschellandsberg.—*Pahrmaceutical Jl.*

NEW MEANS OF PREPARING NITROGEN AND CHLORINE.

BY M. E. G. MAUMENÉ.

THE processes of preparing nitrogen are now very numerous; but except that of the decomposition of the air by the metals, they leave much to be desired with respect to simplicity. The following perhaps may be preferable, *although it gives chlorine at the same time.* This process consists in making nitrate of ammonia act on the hydrochlorate of the base at the same gentle heat.

We have theoretically

$$2\,(NO^5\,H^3\,NHO)+H^3N\,HCl=5N+Cl+12\,HO.$$

Experiment agrees with theory: as soon as the mixture reaches the temperature at which the nitrate fuses, a very brisk action is set up, and it furnishes the results indicated. After the first few moments, the fire may be withdrawn: the decomposition continues and finishes almost entirely of itself.

The preparation thus executed may become dangerous, for two reasons: 1, because it furnishes with great rapidity products which are all gaseous; a rather large quantity of matter would always give the chance of explosion: 2, because the mixture of the two salts becomes pasty, swells up considerably, and fixes itself in the necks of the retorts, producing a complete obstruction.

It is easy to remedy these difficulties: it is sufficient not to act on too large a mass of mixture at once, and to add nearly four times as much sand. The experiment thus becomes very easy. In a few moments, heat causes the development of the gas, without fume and without violence. The heat is then lowered, and the operation proceeds promptly and with great regularity.

The following are the cyphers of the preparation:

100 grammes { 75 dry nitrate of ammonia / 25 dry hydrochlorate ammona

400 ,, sand.

These proportions furnish 2[illegible] quarts of dry nitrogen and 5 quarts of chlorine.

It is needless to observe that the heat is too high to admit of any fear of the production of chloride of nitrogen. The gases never have the slightest odor of it.

When the proportions indicated for the mixture are properly observed, and when the salts are pure, we obtain nothing but water, nitrogen and chlorine.

Some interest may be considered to attach to this new mode of produciug chlorine without binoxide of manganese, and by means of substances which are daily becoming less expensive.—*Comptes Rendus*, No. 15, October 13, 1851.

PROCESS FOR DETECTING IODATE OF POTASSA IN IODIDE OF POTASSIUM.

BY M. H. BONNEWYN.

IT is well known that the iodide of potassium of commerce is often contaminated with the iodate of potassa, and that this product is not without danger in medical use. Several processes have been pointed out, for promptly detecting the adulteration; such as by tartaric, sulphurous, very dilute hydrochloric acids, distilled vinegar, &c. To these processes, which are in general good and expeditious, I think I may add a new one, which, as regards certainty

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and facility, seems to leave scarcely anything to be desired.

It is proved, as M. Soubeiran has demonstrated, in his *Traité de Pharmacie*, that by calcining iodide of potassium containing iodate of potassa, in a porcelain or iron crucible, the iodate is decomposed, losing the oxygen of its base and its acid, and thus being converted into iodide of potassium. Thus, when iodide of potassium, containing iodate of potassa, is exposed to a high temperature, the latter is converted into iodide, with disengagement of oxygen gas. The best character by which the presence of this iodate can be recognised, is furnished by this disengagement. Indeed, nothing is easier than to prove at once, the disengagement of oxygen gas, resulting, as I have already said, from the decomposition of the iodate of potassa, by presenting to the mouth of the retort, an ignited match, which immediately burns with a very brilliant flame; afterwards, in order to ascertain the real quantity of iodate of potassa which was contained in the iodide of potassium, by estimating the weight of the latter, formed by the decomposition of the iodate.—*Journal de Chimie Medicale*, November, 1851.

INTRODUCTION TO THE STUDY OF CHEMISTRY*

NO. V.

CHLORINE (CONTINUED.)

1. HYPOCHLOROUS ACID: PROTOXIDE OF CHLORINE. ClO ·44.

THIS acid, which was called chlorous acid by Gay-Lussac, was discovered by Sir Humphrey Davy in 1811, who called it *Euchlorine*, from its deep yellowish green color. He formed it by mixing in a small retort 2 parts of chlorate of potassa with 1 of water and 1 of hydrochloric acid, and heating very gently, so as to occasion very quiet effervescence; he collected it in small jars or tubes over mercury; but the best mode of examining it is to keep it in the apparatus in which it is generated, or to collect it by displacement in a clean dry phial or jar (Brande.)

PREPARATION.—Soubeiran's experiments had induced the opinion that euchlorine was a mixture of chlorine and peroxide of chlorine; but the subsequent investigations of Balard and Gay-Lussac have greatly increased our knowledge of this body. Balard has given us a process of obtaining it perfectly pure; this process consists in agitating 1 part of peroxide of mercury and 12 parts of distilled water in a bottle filled with chlorine gas: the chlorine is speedily absorbed; if the oxide of mercury be in too small proportion, the deposited powder will be white and a portion of chlorine will remain unabsorbed; the oxide should be in slight excess; it will then continue red, and will absorb all the chlorine. Professor Graham recommends the proportions of 6 drachms of the peroxide of mercury and 1½ oz. of water, to be shaken in a quart bottle filled with chlorine gas. The absorption being completed, the bottle is emptied into a filter, and the liquor, after filtration, is distilled in vacuo; a weak solution of hypochlorous acid is thus obtained; it may be concentrated by a second distillation.

Gay-Lussac's process is as follows: A stoppered bottle is filled with dry chlorine, and a tube, closed at one end, filled to two-thirds with peroxide of mercury, and one-third with fine dry sand, is introduced into it. The stopper, which should be greased, so as to fit the neck hermetically, should now be put in, and the bottle inverted and slightly shaken, so as to cause a portion of the matter contained in the tube to fall out and thus come into contact with the chlorine in the bottle. The chlorine soon loses its color, and, when the stopper is removed under mercury, a diminution of one-half the volume is found to have taken place, and the gas remaining in the bottle is gaseous *chlorous* acid, as Gay-Lussac calls this compound of chlorine with oxygen.

Hypochlorous acid gas may also be obtained by passing a stream of dry chlorine through a tube containing red oxide of mercury in fine powder. A complete reaction occurs, and hypochlorous acid gas issues from the further extremity of the tube and may, like chlorine, be collected in dry bottles. By intense cold, or under pressure, this gas condenses into a bright red liquid.

Balard obtained the pure gaseous acid from the liquid acid produced by his process, by throwing up a quantity of the liquid acid into an inverted jar of mercury, and then passing into it, through the mercury, some small pieces of fused nitrate of lime, which seizes the water and disen-

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* ERRATUM.—The list of the seven compounds of chlorine and oxygen which was printed, by a mistake of the printer, at page 67, should have been placed at the end of the article; and the diagram with which the article concludes should have been in its place on page 67. For this error the printer alone is responsible.

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gages the pure, gaseous, hypochlorous acid.

PROPERTIES.—With respect to the properties assigned by the various authors quoted to this compound of chlorine and oxygen, regard must be had to the period at which they wrote, and to the more or less advanced state of their knowledge. We shall endeavor to render this as clear as possible, and shall give them, as far as we can, in the order of their progression.

Davy found the specific gravity of his gas to vary; he estimated it at about 2·4; Gay-Lussac and Thenard regard it as 3. Water dissolves 10 volumes of it, assuming its peculiar odor and yellow color: it destroys most vegetable colors, previously reddening some of the blues. It decomposes with remarkable facility. With a very gentle heat it explodes, with a flash of light. It sometimes explodes while being collected, or transferred from one vessel into another, or even with the heat of the hand; caution should therefore be used in these operations. When a mixture of 5 measures of this gas and 8 of hydrogen is detonated, water and hydrochloric acid are produced. All burning bodies decompose this gas and burn in it as they would do in a mixture of oxygen and chlorine in the same proportions. Phosphorus takes fire in it and burns very brightly.

According to Balard, water dissolves many times its volume of the pure hypochlorous acid gas, producing a pale solution like that obtained in the first instance by distillation in vacuo. A very slight augmentation of heat causes the decomposition of the gas with explosion and production of heat and light. Cautios manipulation is therefore necessary. The direct solar rays decompose it very quickly without explosion; but an exposure of some hours to a diffused light effects no alteration in it. Its mixture with hydrogen remains unaltered at the ordinary temperature, but on the application of a flame, it detonates with much violence. It is gradually decomposed by bromine and iodine; sulphur, selenium, phosphorus and arsenic decompose it, and occasion instant and violent detonation; it also explodes with charcoal, owing to the condensation which the gas undergoes in its pores. It is decomposed into oxygen and chlorine by the introduction of blotting paper; it is also slowly decomposed by indigo, with more complex results; with oxalic acid, carbonic acid is formed and chlorine is liberated. Balard found the composition of this gas to be analogous to that of Sir H. Davy's euchlorine. He regarded the equivalent of hypochlorous acid as composed of chlorine 72, oxygen 16,—or 88, and not 44—that is to say as Cl_2O_2.

The concentrated aqueous solution of this acid is of a pale yellow; its odor is peculiar and penetrating, and its taste is acrid, but not acid. It has a more rapid action than nitric acid on the skin, and colors it of a dark brown. It undergoes decomposition at the ordinary temperature, and in warm weather must be kept surrounded with ice, and in the dark. Iron filings promptly decompose it. All the metals, except silver, remove its oxygen and become oxidised, evolving chlorine; silver takes its chlorine, and liberates the oxygen. Bromine and iodine are transformed by it into bromic and iodic acids: sulphur, selenium, phosphorus and arsenic, are resolved into their acids, and chlorine is eliminated. By the admixture of a concentrated solution of hypochlorous acid with ammonia, or by placing in it a piece of sulphate or phosphate of ammonia, a small quantity of the explosive chloride of nitrogen is formed; when both solutions are concentrated, effervescence and decomposition occur.

The gaseous *chlorous* acid of Gay Lussac (which is in reality hypochlorous acid) is colorless, and very unstable, frequently exploding at the ordinary temperature. Water dissolves more than 100 times its volume of it. The solution undergoes gradual decomposition, especially in the light, and chlorine, oxygen and chloric acid result; a small quantity of hydrochloric acid is likewise formed by the action of the chlorine on the water. A boiling temperature produces the same results.

"Gay-Lussac shows that the neutralising power of this acid is such that 1 equivalent of it may be represented by ClO, and the neutral chlorite, (hypochlorite) of potassa is $KO+ClO$, and not Cl^2O^2 (as in the case of hyposulphurous acid, which is correctly represented by S^2O^2, that being its equivalent in the neutral hyposulphites.) In the formation of the gaseous acid, it would appear that 1 equivalent of oxide of mercury and 2 of chlorine produce 1 equivalent of chloride of mercury and 2 of chlorous acid ($HgO+2Cl=HgCl+ClO$), and that in the latter, 1 volume of chlorine and half a volume of oxygen are condensed into 1 volume. Gay-Lussac observes that the chlorous acid is probably weaker than the carbonic, though in most cases they mutually displace each other: the chlorites are unstable compounds, decomposed by light and by a temperature of 212° F. into chlorates and chlorides; by the oxyacids they evolve chlorous acid. A chlorite mixed with

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a sufficiency of a metallic chloride and excess of sulphuric acid effervesces, and the metal of the chloride takes the oxygen of the chlorous acid to become soluble in the sulphuric acid, whilst the chlorine of the chloride and of the acid are disengaged; but if the sulphuric acid be carefully added, so as only just to decompose the chlorite, chlorous acid (and not chlorine) is given off. (In the former case $KCl+KO$, $ClO+2SO^3$ yield 2 $[KO,SO^3]$ and 2Cl; but in the latter $KCl+KO$, $ClO+SO^3$ give KO, $SO^3+KCl+ClO$.) In consequence of the feeble acid character of the chlorous acid and of the feeble basic character of oxide of mercury, no chlorate of mercury is formed when chlorine and oxide of mercury diffused in water are made to act on each other, but with the more powerful alkaline bases the case is different, and the chlorous acid, instead of remaining free, combines with them to form chlorites."

Its composition is:

	Atom.		Per cent.
Chlorine	1	36	81·82
Oxygen.....	1	1	18·18
Hypochlorous acid	1	44	100·0

2. Chlorous Acid. ClO^3. 60.

This acid, which is the next degree of the oxidation of chlorine to hypochlorous acid, and which is the *true* chlorous acid, the existence of which in the bleaching liquids of commerce had long been suspected, has been isolated, and its existence has been demonstrated by Millon.

Preparation.—This acid is produced by acting with an equivalent of arsenious acid on an equivalent of chloric acid. A very simple reaction takes place; ClO^5 and AsO^3, producing AsO^5 and ClO^3. The chlorous acid is expelled in the form of gas by gently heating the liquid, and the arsenic remains in solution. Gaseous chlorous acid may likewise be prepared by acting on a mixture of arsenious acid and chlorate of potassa with nitric acid. Only a very gentle heat must be employed, or the gas may be decomposed with a violent explosion.

Properties.—The gas is of a greenish yellow color. It resembles hypochlorous and perchlorous acids in its general properties. Light decomposes it. It oxidises the metals in the presence of water, but has no action on them without the aid of water. It has no action on arsenious acid; consequently, this cannot be resorted to as a means of measuring its bleaching powers.

The composition of chlorous acid is—

			Per cent.
Chlorine	1	36	60
Oxygen	3	24	40
Chlorous acid	1	60	100

3. Perchlorous Acid. ClO^{4}·68.

This compound was discovered in 1815, by Sir Humphrey Davy, who procured it by the following process:—about 50 grains of chlorate of potassa wetted with a few drops of concentrated sulphuric acid, and mixed with a platinum spatula until they form a solid mass of an orange color, are introduced into a small glass retort, and slowly heated in a water bath at a temperature to be carefully maintained below 212° F., which may be done by mixing alcohol with the water. A bright yellowish green gas is evolved, which is rapidly absorbed by water; it may be collected over mercury in small tubes.

This compound of chlorine and oxygen may likewise be obtained by fusing into a mass one part of chlorate of potassa in a small glass retort, and when cold, adding 3 parts of sulphuric acid, and heating in a water bath.

This gas has a deeper color than chlorine, and an aromatic odor. It bleaches powerfully as also does its aqueous solution, and is a powerful oxidising agent. When heated to 212° F. it explodes with a flash of light. Phosphorus burns in it spontaneously and is the only non-metallic simple body that does so. When the gas is decomposed 2 volumes produce three, two of which are oxygen and 1 chlorine. Its specific gravity is calculated at 2·3375. Compared with hydrogen it is as 34 to 1: therefore 100 cubic inches should weigh 72·012 grains at the common temperature and pressure.

The gas was condensed by Faraday by causing the mixture of chlorate of potassa and sulphuric acid to act in a sealed tube for 24 hours. At the expiration of that time, the mixture was of a dark reddish brown, and the gas of a bright yellow color; he then heated the mixture to 100° F and cooled the empty end of the tube to 0°; the mixture gradually lost its dark color, and a liquid, of ethereal appearance was condensed. It did not mix with a small quantity of the sulphuric acid which was under it; when it was allowed to run on to the mass of salt and acid, it was slowly absorbed, and gave the mixture a much deeper color. "The peroxide of chlorine thus obtained is a very fluid transparent substance of a deep yellow color. A tube containing a portion of it in the clean end was opened at the opposite extremity; there was a rush of euchlorine

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vapor, but the salt plugged up the aperture; whilst clearing this away, the whole tube burst with a violent explosion". (Philosophical Transactions, 1823, p. 194.) The liquid thus obtained was solidified by means of the cold of the solid carbonic acid and ether bath: in this state it had the appearance of bichromate of potassa; it was rather hard, brilliant and transparent; it fused at −75°F. and was heavier in the solid than in the fluid state. When solid, it evolved so little vapor that the air above it was not discolored, so that the pressure of its vapor at that temperature must be very slight. "Some hours afterwards," says Professor Faraday, "wishing to solidify the same portion of euchlorine which was then in a liquid state, I placed the tube in a bath at −110° but could not succeed either by the continuance of the tube in the bath, or opening the tube to allow the full pressure of the atmosphere, but when the liquid euchlorine was touched by a platinum wire, it instantly became solid. There are many similar instances among ordinary substances, but the effect in this case makes one hesitate in concluding that all the gases which as yet have refused to solidify at temperatures as low as—166°F. cannot acquire the solid state at such a temperature. (Philosophical Transactions, 1845.)

Sir H. Davy and Gay Lussac regard this gas as consisting of

Chlorine	1	36	52·9
Oxygen	4	32	47·1
Peroxide of Chlorine	1	68	100.0

4. Chloric Acid $Cl.O^5$ 76

Discovered by Gay Lussac. It requires the presence of an atom of water or of a base, as it cannot exist in the anhydrous state. The hydrated acid in its most concentrated state has the formula $Cl.O^5+HO$.

Preparation.—Gay Lussac prepared hydrated chloric acid by driving a stream of chlorine gas into a mixture of oxide of silver and water. Insoluble chloride of silver is formed, and may be separated by filtering: the excess of chlorine contained in the liquor may be expelled from it by heat, and a solution of chloric acid is left. Another process consists in the addition of dilute sulphuric acid to chlorate of baryta dissolved in water, until no further precipitation takes place. Sulphate of baryta, which is insoluble, is thus formed and the acid remains dissolved in the water. It is necessary to avoid using an excess of sulphuric acid, or the chloric acid will be contaminated with it. When the proper proportion has been employed neither dilute sulphuric acid nor a solution of chlorate of baryta render the chloric acid obtained turbid. When a precipitate is formed on the addition of either of these reagents, it must be carefully added until no further precipitation takes place. This aqueous solution of the acid may be concentrated by gentle evaporation. Gmelins process consists in exposing the aqueous solution of oxide of chlorine to the rays of the sun until its color disappears, and by driving off the chlorine at a very moderate heat. It may also be produced by mixing a hot solution of chlorate of potassa with an excess of fluo-silicic acid, filtering the acid liquor when it has become cold, evaporating at a temperature not exceeding 80°, and, after two days, filtering through powdered glass.

Properties.—This acid is sour, and has a yellowish tint when of a high degree of concentration. It first reddens, and then bleaches vegetable blues. It cannot be obtained in the solid form. In its most concentrated form, when it is of a thick, oily consistence, it ignites paper and other dry organic substances. It decomposes alcohol, producing acetic acid. When distilled at above 100° F. it is decomposed; perchloric acid is formed, and oxygen and chlorine are set free. Hydrochloric acid decomposes it into chlorine and water.

The constitution of chloric acid is:

			Per Cent.
Chlorine	1	36	47·4
Oxygen	5	40	52·6
Chloric acid	1	76	100·0

Chlorates.

These are the salts formed by the union of chloric acid with bases. They yield, when deflagrated, oxygen and a metallic chloride. All the chlorates are soluble in water.

5. Perchloric Acid ClO^7 92.

Discovered by Count Stadion. It has not been obtained in the anhydrous state, but only combined with one atom of water or base.

Preparation.—Perchloric acid may be obtained by distilling equal weights of perchlorate of potassa and sulphuric acid diluted with one-fourth of its weight of water. At 280° white vapors pass over and condense as a colorless liquid. It may likewise be obtained by boiling perchlorate of potassa with an excess of fluo-silicic acid, and following the same course as in producing chloric acid in the same way. Another mode is by decomposing equal

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equivalents of sulphuric acid and perchlorate of baryta.

PROPERTIES.—It is the most stable compound of chlorine and oxygen. Hydrochloric acid does not decompose it. It is not decomposed by alcohol; it has no spontaneous action on organic substances. In these points it is distinguished from chloric acid. Its specific gravity, when concentrated, is 1·6; its boiling point 392° F. It may be obtained in the solid and crystallised state, by distillation with concentrated sulphuric acid; solid perchloric acid hisses when thrown into water. Its composition is—

Chlorine	1	36	39·1
Oxygen	7	56	60·9
Perchloric acid	1	92	100·0

The perchlorates are less explosive than the chlorates. They consist of one equivalent of base and one of acid.

6. CHLOROSO-CHLORIC ACID. Cl^3O^{13}.212.

Discovered by Millon. When chlorate of potassa is acted on by hydrochloric acid, a greenish yellow gas is produced. Millon found, however, on cooling the gas, that the liquid which condenses is not perchlorous acid, as had been supposed, but a new body, decomposed by bases into 1 equivalent of chlorous acid, and two of chloric acid. To this body he gave the name of chloroso-chloric acid.

7. CHLOROSO-PERCHLORIC ACID. Cl^3 O^{17} 244.

Discovered by Millon. Perchlorous acid gas, on exposure to light, separates perfectly into chlorine and perchloric acid. If the light be feeble, however, a dark red liquid condenses and runs down in drops. This is called by Millon chloroso-perchloric acid. In damp air it gives out fumes. Heat decomposes it without explosion. Bases decompose it into chlorous acid and perchloric acid. It also gradually undergoes the same decomposition when left to itself.

OF THE EXISTENCE OF ARSENIC IN PLANTS.

BY M. W. STEIN.

M. STEIN has estimated the small quantities of arsenic contained in various vegetable substances. He has made the following determination.

10000 parts of old linen gave 0·11 of arsenic.

10000 parts of rye straw, gathered in the vicinity of a lead smelting works contained 0·009 of arsenic, and 0·4 of metallic lead.

10000 parts of cow dung yielded 3·000 of arsenic.

The arsenic was sought for in the ashes of these substances. The author digested these ashes with hydrochloric acid and passed through the solution a current of sulphuretted hydrogen, which precipitated the arsenic and the other metals in the state of sulphurets. The sulphuret of arsenic was separated by hydrosulphuret of ammonia and converted into ammoniaco-magnesian arseniate by H. Rose's process.—*Journal für praktishe Chemie.*

PRESENCE OF SUGAR IN THE URINE

BY SENOR ALVARO REYNOSO.

THE functions of the rachidian bulb have been studied by many physiologists, all of whom agree in regarding it as the central focus and regulating organ of the motions of respiration. Moreover, M. Flourens has found that there is a very circumscribed portion of the bulb, which is the true seat of respiration. This point was found in rabbits immediately above the origin of the eighth pair, and its inferior limit nearly under this origin. M. Bernard, by puncturing rabbits near the origin of the pneumogastric nerve rendered them diabetic; and he explains this phenomenon by stating that, under the influence of the excitation produced, the liver forms so great a quantity of sugar that, not being capable of being consumed by the respiration, it passes into the urine. I think I shall be able to explain this phenomenon by admitting that, under the influence of the lesion caused by the puncture, partial if not complete paralysation of the respiration takes place, and that the *normal* sugar, not being capable of being burned, passes into the urine. To prove this, it was necessary to find the means of impeding respiration by causing asphyxia: experiment proved that by means of anæsthesia sugar might be produced in the urine.

Our explanation being taken as correct, we should find so much the more sugar as the animal subjected to the etherisation had a more active respiration, for more unburned sugar passes. We have observed, indeed, that less sugar is passed by herboverous animals than by carnivorous animals. Of two men subjected to etherisation, the strongest gave the most sugar.

Finally, it was curious to ascertain if in other circumstances of asphyxia animals would become diabetic. The urine of rabbits

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strangled and drowned yielded sugar: but also it must be stated that we did not obtain it in all cases, probably because these means of asphyxia are accompanied by numerous perturbing causes in the economy.

Thus, a living animal which does not respire would become diabetic. M. Bernard has proved, indeed, that in the fœtus there is always sugar in the urine. We think that it should also be sought for in the urine of persons subjected to hyposthenisant treatment.

One word on the mode of making the experiments. We should always operate on animals, or, better still, on a man, of vigorous condition, and in good health. Urine must be passed before the etherisation. The urine is collected, and treated with subacetate of lead, filtered, and the excess of the salt precipitated by chloride of sodium. The presence of the sugar is sought for in the filtered and concentrated liquor, with an alkaline solution of tartrate of potassa and copper, or by putting it in contact with beer yeast, which converts the sugar into alcohol and carbonic acid.

We think that these experiments will elucidate the nature of diabetes; for they clearly establish the relation which exists between the respiration, the nervous influence and the sugar of the urine.—*Comptes Rendus*, No. 16, October 20, 1851.

REGENERATION OF MANNITE AND QUERCITE FROM NITROMANNITE AND NITROQUERCITE.

BY M. DESSAIGNES.

THE nitrogenous bodies resulting from the combination of nitric acid with organic substances, with the elimination of water, have never yet, so far as I am aware, with the exception of the nitric ethers, been so transformed as to reproduce the organic body from which they have been derived, by substituting hydrogen for the nitric residue N^2O^4, which they contain. I have been enabled to effect this substitution in two bodies of this class—nitromannite and nitroquercite. (I have, with the approbation of M. Braconnot, given the name of quercite to the saccharine matter discovered in the acorn. See THE CHEMIST, Nov., 1851, page 63.)

Very concentrated hydrosulphate of ammonia, saturated with sulphuretted hydrogen, and containing even some bisulphuret of ammonia, is the reagent which I employ to effect this reduction, which is very clear, especially with the nitroquercite. I dissolve the perfectly washed nitrogenous body in alcohol with the aid of heat, and rapidly add a large excess of hydrosulphate of ammonia. An enormous quantity of ammonia is disengaged, and much sulphur is deposited in the liquor, which is quickly evaporated on the sand-bath. The dry residue is redissolved in hot water, and filtered. With nitroquercite, the filtered liquid is nearly colorless. By evaporation are deposited large crystals which are easily purified, and present all the characters of the saccharine matter of the acorn. These crystals, dried *in vacuo* and analysed, furnished, C 43·69 and H 7·71; theory requires C 43·90 and H 7·31.

The nitromannite on which I operated had been crystallised in alcohol and well washed. It could not therefore contain any mannite uncombined with nitric acid. The crude product of the reaction is colorless, especially if the hydrosulphate employed is not concentrated; and it contains in this case a considerable amount of an ammonia salt of an organic acid. The evaporated liquid yields a crystalline mass, which is strongly pressed in paper, and which, on being redissolved and decolored by animal charcoal, produces by spontaneous evaporation prisms of a sweet taste, which present the characters of pure mannite. Indeed, when dried *in vacuo* and analysed, they gave C 39·69 and H 8·03; theory requires C 39·55 and H 7·68.

To these cases I hope to add others, and I am already enabled to say that nitric sugar of milk has given me crystals of a saccharine matter which was doubtless regenerated lactine; but a primary operation did not furnish me sufficient water for analysis.—*Comptes Rendus*, No. 17, Oct. 27, 1851.

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II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

THE INVENTORS' AID ASSOCIATION.

In the early part of the present year, we called the attention of our readers to an Association, which had then just been provisionally registered, the object of which is to afford the fullest assistance to inventive genius; as this association is now about to proceed to obtain a charter, we have selected this opportunity for explaining its objects more fully, and once more confidently recommending it to the notice of our readers.

All those who are acquainted with inventions are aware that, whilst some few names stand pre-eminent as patentees, many of the greatest improvements in machinery, and in chemical processes are the offsprings of the intellect of men of little or no means; sometimes of men of genius who possess no capital but a powerful inventive faculty; sometimes of mechanics earning their honest means of subsistance. It is to aid such as these, that the Inventors' Aid Association has been instituted, and the managing committee intends to give its assistance in various ways.

When an inventor has completed his model or process, and applies to the Secretary of the Association for assistance, on approval, a deed will be prepared, whereby he will agree to the bonus to be paid, and to abide by the decision of the company. The model or process will then be submitted to the consideration of two or three scientific men practically acquainted with the nature of the invention, and capable of pronouncing an opinion on its value, and, if approved by them, patents will be obtained. The invention will then be sold, or a partner found, the inventor agreeing to pay a bonus on the amount of purchase money, or proceeds of sale of licences, or a royalty if the invention has to be worked by himself and partner: this will cover all the expences incurred and leave a handsome dividend for the shareholders.

When an inventor is unable, from want of funds, to complete his model or to perfect his process, he will be furnished with the means of doing so, on giving security, and a patent will be procured for his invention when completed, if approved of. The company will also take out patents for those who choose to employ them for that purpose, who have the means of paying for their own patents, but desire to have their inventions tested by competent and scientific persons, and to ascertain that they are new and useful and not infringements of existing patents or devoid of utility; by this plan much expence and labor will frequently be saved to the patentee.

It must be clear to all that patents obtained by this Association will be much more valuable than any others, owing to the strict investigation which the welfare of the company will render it necessary to make.

Those to whom the patent rights may be offered for sale, or who may be solicited to become licensees, or to enter into partnership with the inventors, will naturally have great confidence in the inventions taken up by the company, from the fact that it has, after fully testing their merits, deemed it prudent to invest large sums of money in patenting them. As the company will in all cases require a handsome dividend upon the amount realised by each invention to be conceded to it, there can be little doubt that the profits to the shareholders will be great when it arrives at full working order.

We beg to refer our readers to the advertisement in our advertising sheet this month, for the usual particulars as to amount of capital, the price of shares, Trustees, Bankers, &c.

We have no doubt whatever of the Association proving eminently useful and successful. Of course there are difficulties to be met, but they have been carefully considered and weighed, and have been submitted to eminent counsel. We have no hesitation whatever in recommending this Association to our readers as affording an opportunity of investing even small sums of money with the prospect of considerable profit, and they will have the additional gratification of contributing to the weal of many others, the produce of whose genius will enrich the world with many an invention which, but for the fostering care of this invaluable association, would, perhaps, never have come into operation.

We cannot conclude this notice without eulogising the action and energetic exertions made by Mr. Robertson the secretary, to whom the society owes its existence, and the great progress it has made.

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RESEARCHES ON THE NUTRITION OF OATS, PARTICULARLY AS REGARDS THE INORGANIC MATTERS WHICH ARE NECESSARY FOR THEIR NUTRITION.

BY THE PRINCE OF SALM HORSTMAR.

(*Continued from page* 73.*)

The mass was not stirred a second time, as in No. XXXVI.

At the commencement, the formation of the stem was as abnormal as in No. XXXVI; the leaves acted in the same manner, but had no ferruginous stains; the edges were smooth, but only those of the four lower leaves of the principal stem. Several lateral shoots likewise made their appearance, with this difference, that the leaves of the lateral shoots had rough edges, that these lateral shoots were developed at the same time as the upper leaves of the principal stem, and that the latter also had rough edges. The whole plant was of a normal green. Finally, it was only when the lateral shoots had attained the same height as the principal stem that the latter began to grow in earnest, as in No. XXXVI.

Principal stem 60 centimetres high; six leaves, 10 flowers, nine fruits; one lateral shoot, which bore five flowers and five fruits, and two lateral shoots without flowers. The plant therefore produced altogether fourteen fruits.

An experiment undertaken at the same time as this, in well calcined river sand, but without chloride of potassium and carbonate of soda, all the other additional substances remaining the same, produced a stem of normal formation, 70 centimetres high, having eight flowers and six fruits, but no lateral shoot. Experiments XXXIII, XXXIV and XXXV, likewise performed in river sand, gave no lateral shoots.

We should also remark that the two portions of river sand which were employed in experiment No. XXXVII and the foregoing experiment were not calcined *together;* consequently, there may have remained, after the calcination, perhaps rather too large a proportion of oxide of iron in the sand of No. XXXVII, which would explain the phenomena manifested in its vegetation. However, the complete absence of ferruginous stains (which always occur when the oxide of iron is in excess) and the remarkable fructification entirely prevent us from admitting that these phenomena were caused by too much iron in the sand.

Since the two experiments are distinguished only by chloride of potassium and carbonate of soda added in one case and omitted in the other, it must be concluded that these two bodies, or, at least, one of them, cause:—

1. The formation of lateral shoots in river sand, which had not previously occurred.

2. The formation of lateral shoots before the formation of the flowers of the principal stem and their fructification.

3. An augmentation in the production of fruits.

NO. XXXVIII. FLINTS COARSELY POWDERED.

With chloride of potassium and carbonate of soda.

The flints were ground in an iron mortar, then calcined, boiled with hydrochloric acid and well washed.

The additional substances were the same as in No. XXXVII; only 0·025gr. magnetic oxide of iron, pulverised with about 1 decigramme of sugar charcoal, was added. After ten days' rest, the mass was stirred and mixed as in No. XXXVI.

At the commencement, the growth of the plant was normal; but the green was not bright; the lower leaves had rough edges, whilst the upper leaves had smooth edges. There were many stains on the leaves; the fifth leaf was not completely developed. The plant, which was perceptibly sickly, did not grow beyond 8 centimetres, had no flowers, and put forth several lateral shoots five centimetres in length and of abnormal formation.

The cause of the deficient growth of this plant was not discovered; it cannot have been owing to the flint having been too coarsely ground, which would prevent its intimate mixture with the additional substances, for the powdered flint was not coarser than the quartz used in the foregoing experiments.—*Annales de Chimie et de Physique,* 63e Series, t. XXXII, page 41.

NO. XXXIX. ARTIFICIAL CARBONATE OF LIME, WITHOUT TRACES OF CHLORINE.

gr.		
0·040	silicic acid	silicate of potassa dissolved in 7 grammes of water.
0·019	potassa ..	
28·0	carbonate of lime.	

* The portion of this article which we publish this month, commences with the latter part of Experiment XXXVII. This mis-division was made by the printer, who was supplied with copy to the end of Experiment XXXVII. The division should have been made at the conclusion of an experiment.

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0·04 phosphate of lime.
0·05 sulphate of lime.
0·02 carbonate of magnesia.
Iron wire.
0·05 nitrate of ammonia dissolved in 10 grammes of water.
0·002 carbonate of manganese added afterwards.

The 28 grammes of carbonate of lime, forming here the medium to contain the roots, were obtained by nitrate of lime purified from any chlorine it might contain, by means of nitrate of silver; the silver was afterwards removed by a current of sulphuretted hydrogen; it was precipitated with very pure oxalate of lime, and the oxalate of lime formed, was calcined. The iron wire was fixed in the soil to furnish the ferruginous principle; this means was selected because it was thought that it would be difficult to mix intimately 25 milligrammes of magnetic oxide of iron with the carbonate of lime prepared as above indicated, and that lumps would be formed.

Several days after the mass had been deposited in the vessel, pieces of rusty iron wire were inserted in several parts of it, and immediately withdrawn, leaving in the soil by the friction, the necessary quantity of iron. This operation had also the advantage of preventing the soil from becoming too compact.

When the fourth leaf showed ferruginous stains, the iron wire was withdrawn, and the 2 milligrammes of carbonate of manganese, above mentioned, were added.

Stem 19 centimetres high; leaves of a deep green; some ferruginous stains on the lower leaves; the leaves had rough edges; four flowers; four very small fruits.

The water with which the charcoal of the carbonised plant was washed, treated with nitrate of silver, gave a slight turbidness. Some traces of chlorine must, therefore, have got in, although it was always watered with distilled water.

This experiment does not positively prove that oats do or do not require chlorine.

No lateral shoots.

The medium here prepared for the plant was by no means suitable to it; still, the formation of two small fruits is remarkable.

NO. XL. ARTIFICIAL CARBONATE OF LIME, PURIFIED FROM CHLORINE AND ALUMINE.

gr.
0·035 silicic acid . } silicate of potassa
0·018 potassa .... } dissolved in 10 grammes of water.
22·0 carbonate of lime (not calcined.
0·04 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
Iron as in No. XXXIX.
0·030 nitrate of ammonia, dissolved in 5 grammes of water.

The carbonate of lime was prepared from nitrate of lime, purified from chlorine, and the alumina removed from it by means of hydrosulphate of ammonia, which was not done in No. XXXIX; after the volatilisation of the hydrosulphate, it was pecipitated by carbonate of ammonia, but not calcined.

The plant rose to 8 centimetres, produced no stem, and died on the appearance of the fourth leaf, without any flowers. The leaves were of a very pale green and very long.

It is clear that this soil was more inimical to the plant than that of No. XXXIX, both chemically and mechanically.

NO. XLI. POWDER OF ROCK CRYSTAL CALCINED.

With fluoride of calcium and artificial felspar.

gr.
0·035 silicic acid . } silicate of potassa
0·018 potassa .... } dissolved in 10 grammes of water.
0·1 carbonate of lime.
0·005 fluoride of calcium.
0·03 phosphate of lime.
0·03 sulphate of lime.
0·02 carbonate of magnesia.
0·1 artificial felspar, composed as in No. XXXI.
0·025 magnetic oxide of iron.
0·001 carbonate of manganese.
0·038 nitrate of ammonia, dissolved in 1 gramme of water, mixed with the solution of silicate of potassa, heated until the ammoniacal odor had almost entirely disappeared, diluted with water, and brought to the bulk of 17 grammes of water.

The second and third leaves of a very pale green, with yellow streaks; the fourth and fifth leaves, greener, but still having some yellow streaks: the sixth and seventh leaves of a deep green, and very vigorous; the sheath of the sixth leaf curiously colored of a purple red. The plant grew very slowly at first.

Height of the stem, 35 centimetres: seven leaves; no flower.

Three lateral shoots were formed when the seventh leaf appeared on the principal stem.

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NO. XLII. SAND OF KÖNIGSLUTTER.

With the ashes of two vigorous oat plants, including their fruits..

We at first sought to free the sand from alumina by repeated washings. Then, after having intimately mixed it with the ashes, 3 centigrammes of nitrate of ammonia, dissolved in 17 grammes of water, were added.

The first leaf was developed very well, but it inclined under the direct influence of the sun, and raised itself again in diffused light; the second leaf attained its complete development, only it was yellowish at its base, and very soon became of a rusty red at the point. The plant died before the development of the third leaf.

As the plant of Experiment No. II. had borne a larger dose of nitrate of ammonia, it would seem that in this case the death of the plant must be attributed to the presence of the ash added. The injurious action of this ash must be assigned to the décomposition of the sulphates during the combustion, and consequently to an absence of sulphates, as in Experiment No. XI, rather than to the circumstance that the ashes of two oat plants might have given any inorganic constituent in too large proportion. The action of a small quantity of metallic sulphuret may also be suspected.

The object of this experiment was to investigate whether the ash of the plant *itself* contains all the inorganic matters necessary for forming fruits in normal number proportional to the number of the flowers.

We thought it possible that a certain inorganic matter of the soil must have been *necessarily* found in the soil, nevertheless, without the roots absorbing it, by acting only by catalytic action.

This experiment must be regarded only as preliminary; it was only intended to ascertain if the plant can support its own ashes; hereafter it will be continued in pure rock crystal.

NO. XLIII. ARTIFICIAL SILICIC ACID CALCINED.

gr.		
3·035	silicic acid . }	silicate of potassa
0·018	potassa .... }	dissolved in 10 grammes of water.
0·1	carbonate of lime.	
0·04	phosphate of lime.	
0·03	sulphate of lime.	
0·02	carbonate of magnesia.	
0·02	magnetic oxide of iron.	
0·05	nitrate of ammonia, dissolved in 10 grammes of water.	

This experiment was made in porcelain vessels, lined with wax; the following experiments were performed in similar vessels.

The silicic acid in which the plant vegetated was equal in bulk to the sand and quartz employed in the foregoing experiments. It was obtained by treating silicate of potassa with nitric acid.

The first leaf was green: the second, of a very pale green, which necessitated the addition of 1 centigramme of magnetic oxide of iron; still, the third leaf was developed of an equally pale color; a piece of iron wire was then embedded in the soil, which gave a rather greener color to the succeeding leaves, without making them lose their paleness.

Stem, 54 centimetres high, very thin and languishing; inclined.

Six narrow, pale leaves; three incomplete flowers, without fruit.

Two languishing lateral shoots.

The artificial silicic acid did not suit the plant as a medium for the roots, even when it had been carefully washed and calcined. Silicic acid thus prepared always retains acid reactions when it is laid wet on litmus paper: this reaction is manifested also after calcination, when it is left for a short time on litmus paper: silicic acid, precipitated by carbonate of ammonia, and calcined, presents the same phenomenon. However, we are certain that this acid reaction was not injurious to the plant. Indeed, in making the oat vegetate in this silicic acid, *without* any additional substance, we obtained a healthy product, colored of a deep green, although small and weak, like all vegetables which have sprung up in a soil containing no nutritive additional substances. The plant produced in this case was remarkably weak.

The reason of this bad growth, in a medium provided with additional substances, would seem to be attributable to the *porosity* of the silicic acid, to the air contained in its pores, which occasioned bubbles among the particles of silica when it was watered; these bubblings changed the position of the silicious particles, and thus wounded the fine radicles of the plant. The roots of the plant were, indeed, remarkably fine.

NO. XLIV. ARTIFICIAL SILICIC ACID CALCINED.

The silicic acid was prepared as in No. XLIII.

gr.		
0 035	silicic acid . }	silicate of potassa
0·018	potassa .... }	dissolved in 7 grammes of water.
0·1	carbonate of lime.	
0·03	phosphate of lime.	
0·02	sulphate of lime.	

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0·01 carbonate of magnesia.
0·03 magnetic oxide of iron, as free as possible from manganese.
No iron wire.
0·03 nitrate of ammonia, dissolved in 10 grammes of water.

As the second leaf of this plant was of a very pale green, verging on yellow, 1 centigramme of magnetic oxide of iron was added, but without success; for the third leaf, as well as the succeeding leaves, were all of a pale yellowish green.

Stem 30 centimetres high, and languishing; two flowers; one fruit.

The same experiment was repeated in silicic acid, obtained from silicate of potassa, by means of hydrochloric acid; the same additional substances were employed with 1 centigramme of sulphate of lime, and 1 centigramme of carbonate of magnesia, in addition.

Stem 24 centimetres high; leaves of a very pale green.

Two flowers, one fruit.

The roots were short; they had brown places at several parts, and seemed to have been diseased.

NO. XLV. BERLIN PORCELAIN, COARSELY POWDERED.

gr.
0·047 silicic acid . } silicate of potassa
0·020 potassa .... } dissolved in 10 grammes of water.
0·14 carbonate of lime.
0·04 phosphate of lime.
0·05 sulphate of lime.
0·01 carbonate of magnesia.
0·005 carbonate of manganese.
0·05 nitrate of ammonia, dissolved in 10 grammes of water.

The iron necessary for the mass was introduced into it with the porcelain, which was ground in an iron mortar.

The larger fragments of this mass of pulverised porcelain, were of the diameter of 3 millimetres. The finer portions of the porcelain were eliminated, because they contain combinations of chlorine which it is very difficult to remove by washing. The coarse parts were carefully washed, until the salts of silver gave no reaction. The bulk of the mass of powdered porcelain was one-fourth larger than that of the quartz, &c., used in the foregoing experiments.

As the first leaf did not appear to be developed regularly, the mass was again mixed, and a new seed was placed in it, and soon vegetated properly.

Height of the principal stem, 62 centimetres; leaves normal; nine flowers, without fruits.

When this stem had flowers, a very vigorous lateral stem sprang up, bearing three flowers, without fruit; this shoot was succeeded by another, which had four flowers, and two fruits.

This formation of fruits on the last shoot which sprung up, is very remarkable.

The plant required frequent watering, because the soil, being composed of large particles, dried rapidly, especially as the porcelain vessel used in the experiment was of the diameter of 7 centimetres at the top, and as the evaporating surface was, consequently, larger than in the other experiments.

This plant, which was singularly vigorous, cut down and weighed with the lateral shoots after desiccation, gave the weight of 1·2 gr.

It was carefully calcined in a crucible, until the crucible began to be red-hot; the water with which the charcoal was washed, having been concentrated, heated with nitrate of silver, gave only a slight turbidness of chloride of silver; it was very perceptible, but inappreciable in weight.

RESULTS AND OBSERVATIONS.

The following would appear to be the results of the foregoing experiments:—

1. Without inorganic and nitrogenous additional substances, the oat grows in well calcined sand; its devolopment is normal, but very languishing: it remains small; the number of flowers is reduced to two, and that of the fruits to one, although the sand was not completely free from silicates, and traces of phosphate of iron. The assimilation of the principles of the atmosphere is very minute.

2. With nitrogenous additional substance, (without mineral additional substances) we obtain in this same sand (which also contains traces of silicates), a taller plant, bearing one flower and one fruit more, but the stem loses the power of sustaining itself. The assimilation of atmospherical principles is also very minute. In quartz, combined with the above-mentioned additional substances, there is scarcely any stem, and no flowers. The assimilation is almost completely suspended.

3. Without nitrogenous additional substances, but with the addition of the following seven bodies:—

Silicic acid,
Potassa.
Lime,
Magnesia,
Iron (oxide)
Phosphoric acid,
Sulphuric acid,

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the plant remains small and languishing, as in the first case; but the formation of the flowers is still more restrained, and that of the fruits completely at an end: on the other hand, a disposition to form a second stem is observed. The end of the vegetation, therefore, is not normal. The assimilation is very feeble.

4. If these seven inorganic matters are mixed with nitrogenous additional substances, and if they are presented to the plant in a suitable manner, (Experiment XVII), the growth of the plant then becomes not only normal, but also vigorous; the formation of flowers is considerably increased. However, the normal formation of the fruits, with normal termination of the vegetation, has not yet taken place, but a tendency to the formation of new stems (lateral shoots) is observed.

Assimilation now takes place with vigor, and the conditions of the assimilation appear only now to be fulfilled.

5. But if one of the above-mentioned seven inorganic bodies is wanting, the nitrogenous additional substances being retained, then the development of the organs is entirely or partially disturbed, or else their appearance is abnormal, and takes place as follows:—

Without lime, the vegetable dies at the second leaf, without the formation of a stem.

Without magnesia, the stem is languishing and inclined; the color is abnormal; the formation of the flowers is modified, and the flowers are stunted; no fruits. (A new experiment, performed with well washed sugar charcoal, but the magnesia left out, gave a plant without any flower, of miserable appearance, and with an incomplete formation of stem.)

Without potassa, formation of a very short, very languishing, inclined stem; color abnormal; one flower, and that incomplete.

Without soluble silicic acid and without potassa, the formation of the stem stops at 8 centimetres; color abnormal; the leaves appear prematurely; no flowers.

Without phosphoric acid, formation of a languishing, inclined stem; color pale; one flower, complete; no fruit; on the other hand, a disposition to form a new stem.

Without sulphuric acid, no stem; the plant died at the third leaf, after having unsuccessfully endeavoured to form a new stem.

Without iron, the green color is more or less wanting in the plant, which resembles a vegetable grown in a dark place: the formation of flowers ceases, or is profoundly modified (Experiment XII), which is characteristic. (When there is magnesia in the soil, the formation of the flowers appears not to suffer so much from the absence of iron (Experiment XVI); however, the magnesia then employed may have contained some traces of iron. In a subsequent experiment, made in perfectly washed sugar charcoal, the plant, deprived of iron, produced neither stem nor flower, and only almost white leaves).

6. It would appear, then, that in these seven inorganic bodies consist the constituent parts necessary to oats, and that they are sufficient to the complete development of the flowers, when the nitrogenous substance is not wanting. The experiments do not positively prove that chlorine should form part of this series, for traces of chlorine were always found in the plants grown in the media in which the accidental admixture of chlorine was guarded against, either by care in appropriation, or by watering with double distilled water. The presence of chlorine could not be attributed to the seed, for at present the presence of this body has not been detected in the seed.

As regards the formation of the fruits, these seven bodies do not appear to be by any means sufficient, a point to which we shall recur further on.

7. Soda seems to be incapable of replacing potassa (Experiment XXI).

8. According to the foregoing, most of the results of these experiments in quartzose sand and in quartz completely agree with the experiments which we performed, in 1848, in sugar charcoal. It must be observed, however, that the sand contained traces of silicates; that the media of Experiments, Nos. I, II, III, IV, were not absolutely free from phosphate of iron, of which the sand contained traces; that finally, the sugar charcoal, as was afterwards discovered, was not absolutely free from traces of inorganic matters.

9. But the experiment without inorganic additional substances, with nitrate of ammonia, gave very different results, when it was performed in sugar charcoal, and when it was performed in sand; this was owing to too much nitrate of ammonia being used in the sugar charcoal, as was shown by the roots.

The difference which separates the results of the experiments undertaken in a similar way as regards iron, arise also from the quantity of iron employed, as was finally shown.

Manganese does not appear to be necessary for the oats, at least before the formation of the fruit (Experiment No. XVII), when there is not too much iron in the

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soil. It was difficult, with sugar charcoal, to solve the question as regards manganese, because the solution of iron, which is much greater in humid charcoal, prevented us from ascertaining the proper proportion of that metal; which, for the experiments in charcoal, and on account of the excess of iron, seemed to render manganese necessary. (For a similar reason, manganese will always be relatively necessary for the plant in every soil in which the proportion of iron often amounts to more than 1 per cent., and in which this iron is in perpetual contact with humus.)

10. Too much iron renders the formation of the stem abnormal; the leaves are covered with dried brown points (ferruginous stains) in several places (which agrees with the experiments in sugar charcoal, in which, nevertheless, the stains had a different color). The formation of the flowers is rendered difficult, and that of the fruits is stopped.

But the plant requires a very small quantity of iron, which is demonstrated by the experiments made with the ash of the plant of Experiment XXXV; this plant having had a normal fructification and termination, had grown up in river sand washed with hydrochloric acid, and provided with the necessary additional substances, but without any particular addition of iron.—*Annales de Chimie et de Physique.*

(*To be continued.*)

JATROPHA MANURE.

To the Editors of The Chemist.

GENTLEMEN,—The October number of THE CHEMIST contains a reprint of my paper on "Jatropha Manure." Perhaps you will kindly permit me to correct a slight error, which I find I inadvertently committed in the communication in question. The plant which yields the seeds, I am informed, is the *Jatropha curcas* of botanists, or "Purgeira" of the natives of the Cape Verde Islands, and not a variety of the *Palma Christi*, as I there stated. The mistake arose from the fact of the friend, to whom I showed the seeds and applied for information respecting them, having regarded them as a sample of roasted *Ricinus* nuts, which they certainly much resemble in both size and shape; whilst the rough, cracked appearance of the seed-coats greatly favored the illusion.

I remain, Gentlemen,
Your obedient servant,
THORNTON J. HERAPATH.

Mansion House, Old Park, Bristol,
November 20, 1851.

NOTE ON A MODIFICATION TO BE INTRODUCED INTO THE PREPARATION OF BUTTER, WHICH WOULD IMPROVE ITS QUALITY AND ENABLE IT TO BE KEPT LONGER.

BY M. CHALAMBEL.

IF butter contained only the fatty parts of milk, it would undergo only very slow alteration in contact with the air. But it retains a certain quantity of caseum which exists in the cream; this caseum is converted into a ferment, and gives rise to butyric acid, to which the disagreeable taste of rancid butter is owing. The washings which the butter is made to undergo can only imperfectly free it from this cause of alteration, for the water does not moisten the butter, and cannot dissolve the caseum, rendered insoluble under the influence of the acids which are developed in cream. A more complete purification may be arrived at by saturating these acids, the caseum would again become soluble, and consequently the butter would retain only very small quantities which would be removed almost entirely by washing.

The following is the way in which I propose to operate: when the cream has been placed in the churn, pour in, by small portions at a time, and agitating the while, a *sufficient quantity of milk of lime to entirely destroy the acidity*; churn the cream until the butter is separated, but it must not be expected that it will collect in lumps as it generally does; decant the buttermilk, and continue to churn until it is sufficiently collected; it is then removed from the churn, and arranged in heaps as usual. By following this method, I have always obtained better products, and capable of being preserved for a longer time than those obtained by the common processes. The buttermilk loses all its sharp taste, and has been consumed with pleasure by people and animals, and has lost its laxative properties.

We have also restored, by washing with lime water, butter which could only be used for melting.

Lime water may be replaced by any other alkaline ley.—*Comptes Rendus*, No. 16, Oct, 20, 1851.

ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.*

Improvements in manufacturing and refining sugar. HERMAN SCHRODER, of

* Collected from *The Mechanics' Magazine.*

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Bristol, gentleman. Patent dated April 15, 1851.

This invention has relation to apparatus for evaporating and granulating cane-juice or liquids containing saccharine matters capable of crystallisation, and consists in combining with a pan or vessel, heated by steam or other heated fluid contained in or passing through a pipe or series of pipes or passages inserted in or through the pan or vessel employed, a series of discs or surfaces capable of moving or revolving, partly immersed in the liquid to be evaporated or granulated. The operation is performed by bringing the heated particles of cane-juice or saccharine liquid into contact with air by the revolution of the discs, whereby evaporation to a great extent is carried on at a temperature below the ordinary boiling point of the liquid. The patentee prefers the pan or vessel to be of the sectional form of a segment of a cylinder, with the discs (which are of a circular form) mounted on a horizontal axis above the pan, and revolving partially immersed in the liquid, and with the heating pipes arranged in tiers across the pan, and occupying a position intermediate to the discs; he does not, however, confine himself to that particular form of vessel, nor to any particular shaped pipe or arrangement of pipes or passages for conveying heat to the liquid. The temperature is regulated by cocks or other suitable means.

Claim.—The combination of moving or revolving discs or surfaces with pans or vessels, heated by pipes, or tubes, or passages containing steam or other heated fluid.

Improvements in the use and treatment of peat and its products, and other carbonaceous matters; and also for apparatus applicable to such and other chemical purposes. WILLIAM BENSON STONES, of Warwick Street, Golden Square. (A communication.) Patent dated April 15, 1851.

The improvements which form the subject of the present patent comprehend—

1. A method of charring or distilling peat or wood, or tanners' bark and coal together, whether for the purpose of making a peculiar sort of coke, or with the twofold object of producing gas and making such coke.

With a view to obtain a compact description of fuel, and to obviate the necessity of compressing peat previous to its being charred, the patentee has contrived the present system according to which equal quantities of dry powdered peat and pulverised coal (which should possess the property of caking well, and be as free as possible from sulphur) are mixed together by means of an apparatus herinafter mentioned, and exposed to heat in suitable retorts. The expansion of the coal and contraction of the peat under the application of heat produce a considerable solidifying effect on the coke, but under circumstances where a more dense and compact fuel is required, the mixture is subjected to mechanical pressure in the retort, by means of a sliding plate, fitted to the interior thereof, and acted on by a screw passing through the end of the retort, and worked by hand. The gas produced by this distillation may be applied to illuminating purposes; and where this is done, it is recommended to pass the gas in contact with incandescent peat, for the purpose of completing the distillation of the gaseous products of the peat, and causing the gas to absorb carbon, by which its illuminating power is increased.

2. The application of the greases and resino-adipose wax obtained from peat by distillation, and which, in the specification of a former patent were called adipolein and adiposole, to certain useful purposes, such as the currying of leather (for which purpose the patentee considers them to be superior to oil or other materials commonly used) and the preparation and treatment of textile materials, to render them impervious to wet, and elastic. It is better to apply these greases in a warm state, as they will then more readily penetrate the pores of the material operated on, and will also carry with them any portion of wax which they may contain. By subjecting the grease adiposole to a second distillation, an oleous liquid will be obtained together with a residuum (a resino-adipose wax which the patentee calls peacerine), which produces a fine black polish when applied to leather, and subjected to rubbing with a smooth and hard surface. These greases and wax may be also mixed with gutta percha, the latter being dissolved in bisulphuret of carbon. To the gutta percha thus prepared may be added cork, turf, or rags reduced or pulverised, and the material thus produced while warm, may be rolled into sheets or tubing, and will be found suitable for making various articles.

3. The manufacture of manures by combining peat, turf, humus, or other vegetable matters, with other substances of different kinds, such as urine, stable dung,

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blood, sawdust, marl, ashes, sand, burnt clay, or other matters, adapted for manuring purposes. These manures may be applied broad cast, or in any usual manner, or the seeds, grains, or roots, having been wetted with a liquid of an adhesive nature may be covered or sprinkled therewith, and then sown. Strong smelling matters, such as shale oil, or coal tar oil, may be also combined with them for the purpose of preserving the seeds or plants to which they are applied from the attacks of insects. For the purposes of this invention, the patentee recommends the collection into reservoirs of the urine from stables in towns, and in consequence of this suggestion he "claims the right" of collecting and carrying away urine from stables for the purpose of making manures by preparing and mixing them with vegetable organic matter, or of depositing the vegetable organic matters in the reservoirs to be saturated and afterwards carried away for the purpose of being made into or serving as manure.

4. An arrangement of apparatus for mixing, digesting and otherwise treating dry substances, fluids, or gases. This "churn" consists of a cylinder capable of revolving in a horizontal position and provided internally with tilting shelves or leaves projecting towards the centre. In certain cases where the application of heat is desirable, it is placed over a stove in such a position as to permit the heat therefrom to act upon it.

Claims.—1. The charring of peat or wood, or tanners' bark and coal together, whether for the twofold purpose of producing gas and making the above-mentioned description of coke, or for the sole purpose of making the coke.

2. The greases and resino-adipose wax obtained from peat, and herein denominated adiposole, adipolein, and peacerine, for currying and polishing leather, and also for strengthening it and rendering it and other materials waterproof, and the various other uses herein mentioned and alluded to.

3. The use of peat, or turf, or humus, or other decomposed, or partly decomposed, vegetable matter to be applied by attaching it to the seed, or grain, or bulb, or root, &c., either alone or with other matter or ingredients, and reduced to a powdered or pulverised state for the purpose, and so prepared for the purposes of manuring generally; whether to be used alone or in combination with other fertilising matter or substances, as described, and so as to form a manure resembling farmyard manure in a concentrated and condensed state only, or the like manure with the addition of other matter and inorganic substances combined, so as to give it the twofold character of an organic and a mineral and mechanical manure at the same time; and otherwise prepared or modified.

4. The system of apparatus described for mixing, digesting, bleaching, washing, purifying, and otherwise chemically treating matters, and fluids, and gases and its application to other useful purposes.

Improvements in dressing, embossing, and ornamenting leathers. FREDERIC WILLIAM EAST, of the firm of Thomas East and Son, Bermondsey, leather dresser. Patent dated April 15, 1851.

This invention consists in dressing, embossing and ornamenting the flesh side of leather. It has heretofore been usual, when leather has been dressed and embossed, in order to ornament it, to dye and emboss the grain side thereof, by which a close smooth and comparatively inferior effect is produced; but by dressing, dyeing and embossing the flesh side, a very improved effect is obtained. The invention applies to sheep and other skins tanned with shumac, or other tanning matter, but not to oil-tanned skins; and for carrying it into effect, the patentee prefers to employ sheep skins tanned with shumac, but other skins, and differently tanned may be used. The skins are to be shaved just sufficiently to cut out flaws, and render them of uniform substance throughout, and after immersion in warm water of a temperature of about 120° Fahrenheit, they are to be brushed on the flesh side to remove filth and open the fibre, preparatory to dyeing. Each skin is then to be folded with the grain side inwards, and the flesh side outwards, and the edges are to be sown together, to prevent the dye getting to the interior of the bag so formed, or in place of folding each skin separately, two skins may be laid together with the grain sides in contact, and then have the edges sown, to keep out the dye. They are then "scoured" and "sweetened" as is well understood, and are next to be dyed, but the dyeing process will be found to require a longer time than when dyeing on the grain side of skins, which has been the usual practice heretofore; and in place of using strong dye liquors, such as used for dyeing the grain side of skins, it is preferred to employ weaker dye liquors, and to repeat the process oftener, by which means the dye penetrates the fibres and produces a more even color. The skins are then rinsed, opened out and dried. When dry, they are to be "perched" on the flesh

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side; the perching knife, however, should not be so sharp as to cut the flesh off, the object being to loosen and open the fibres and produce a nap-like surface. Each skin is again to be folded, with the flesh side outwards, and is then to be passed through a solution of glutinous matter, which the patentee prefers to compose of one part, by measure, of size, or glair, dissolved in three parts of water. Whilst still wet, the skins are to be strained on boards to dry; after which the edges are to be trimmed, and the surfaces bruised with cork to render them soft, the flesh side being still kept outwards, instead of the grain side. When the process of embossing is to be performed, clean water is applied evenly and smoothly on the grain sides of the skins, and they are laid with their grain sides flat together for about two days, covering them to exclude the air, by which means the moisture will pass through, so as to act on the glutinous matter, and make it of service in causing a gloss on the embossed or pressed parts of the surface, and also in producing a deeper tone of color to those parts. The embossing is preferred to be performed by heated rollers or surfaces suitably engraved, as heretofore employed when embossing velvet, and heated to about 250° Fahrenheit. In addition to dyeing, pigments and metals may be used to give increased ornamental effect to the flesh side of tanned skins; such pigments and metals being applied in the state of powder, by sifting them over the surface, or parts thereof, by which means when the process of embossing has been accomplished, the pigments or metals will be fixed by the glutinous matter, and the pressure on those parts, where such pressure has been applied, and may be dusted off, or removed from the other parts of the surface. This mode of applying pigments and metals is also adapted for being used on the grain side of tanned skins when ornamenting the same by embossing.

Claim.—The mode of dressing, embossing, and ornamenting leather above described.

PROCESS FOR TREATING ORES AND MINERALS—FOR SEPARATING THE METALS—AND FOR THE MANUFACTURE OF ALKALI AND CHLORINE*

BY MR. W. LONGMAID.

In the year 1839, owing to changes in the commercial policy of Sicily, whence the main part of the sulphur used in the manufacture of sulphuric acid in this country, had previously been procured, attention was strongly directed to the separation of sulphur from the metallic ores of this country in which it exists; and it was soon found that this useful substance might be advantageously disengaged from iron pyrites. Whilst investigating this subject, Mr. Longmaid, by a series of consecutive experiments (upwards of 2000 in number), was led to the discovery of several very important facts relative to the manufacture of soda and chlorine, and the separation of certain metals from the ores in which they were contained.

Ordinarily, soda and chlorine are manufactured by decomposing common salt with sulphuric acid, producing sulphate of soda and hydrochloric acid. The former is decomposed by the action of carbon and lime in a reverberatory furnace, producing crude soda, which, being subjected to the action of carbonic acid, forms carbonate of soda—the ordinary commercial soda. Bin-oxide of manganese is treated with the hydrochloric acid, and chlorine is evolved, for the manufacture of bleaching powder, and other compounds of chlorine.

In the process of smelting copper ores, for the purpose of obtaining metallic copper, a large portion of the sulphur and other volatile matters is driven off to waste at the several calcinations; a considerable waste of tin and copper also occurs when these metals are found combined in the same ores, whilst the silver existing so universally in copper ores is almost entirely lost.

Mr. Longmaid's improved process is as follows:—A given quantity of copper ore and rock salt, to which a small quantity of oxide of iron is added, are ground fine and submitted to the action of heat, in a furnace of a peculiar construction. The product of this treatment termed "sulphate ash," is a mixture of sulphate of soda, soluble salts of copper and silver, insoluble oxide of iron and tin, with a small portion of undecomposed salt, and the silica of the ore. This sulphate ash, whilst still hot, is placed in large vats, and lixiviated with water; the strong liquor thus obtained is run off into other vats, where, at a temperature of 150° Fah., the precipitation of the copper and the silver is effected by means of old iron. The liquor, free from copper, is now run in measured quantities on to a weighed quantity of lime, previously placed in a black ash furnace, after which the process proceeds as in the ordinary mode of manufacturing soda. At St. Helen's, Lancashire, where this process is applied on a commercial scale, the copper and the silver are pre-

* To this process a Council Medal of the Great Exhibition was awarded.

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cipitated together; the copper is afterwards oxidised, and used for the manufacture of sulphate of copper, in which case the silver remains as a residual product (mixed with some portion of oxide of iron), varying from 503 to 2000 ounces per ton of residuum.

The precipitated copper tests from eighty to ninety-five per cent. pure copper, the impurities consisting of oxide of iron and sulphate of lime, the latter arising from the impure water used at St. Helen's. The copper may, however, be precipitated in a state of greater purity.

When the ore contains tin, the refuse is washed, as in dressing tin ore, and calcined, by which means the oxide of tin remains unchanged, except that it is freed from the copper, sulphur, and arsenic, &c., with which it was mechanically combined in the ore. The iron in the ore, is converted, during the process, into salts of that metal, and subsequently it is reduced to the condition of oxide, useful for many purposes. The manufacture of bleaching powder is performed as follows:—A furnace is partially charged with calcined sulphate ash, and a current of dry air passed in contact with it; the chloride of iron is decomposed, forming oxide of iron and chlorine, the latter of which, being evolved, is passed into a chamber containing hydrate of lime. Bleaching powder is thus produced. The residuary oxide of iron forms, when washed, dried, and ground with oil, a pigment of a rich purple brown tint, of great durability. A black paint, useful for marine and other purposes, may be obtained by heating the oxide of iron with carbonaceous matter in a closed retort, and grinding the black residue with oil. The raw materials used in the process are chloride of sodium, metallic sulphides (containing copper, silver, tin, iron, sulphur, and other matters), carbonate of lime and coal. The products are copper, silver, tin, iron, sulphur, sulphate of soda, carbonate of soda, hypochlorite of lime, and oxide of iron. The chemical changes effected are as follows:—The mixed ore and salt being exposed to the united action of atmospheric air and heat, a mutual decomposition ensues. At first the oxygen, uniting with the sulphur, forms sulphuric acid, which, in its nacent condition, reacts on the salt, the sodium taking oxygen at the same time, which, combining with the sulphuric acid, forms sulphate of soda; a portion of the chlorine of the salt thus liberated, combines with the metals of the ore, forming chlorides more or less fixed. If arsenic be present, it readily unites with the chlorine, and in this condition, it not only becomes extremely volatile, but is also, from its great affinity for water, readily condensed. Chlorine and iron having combined, this product next undergoes decomposition; the iron taking oxygen forms the oxide, whilst the chlorine is evolved free, and under the conditions above described, fit for the manufacture of hypochlorite of lime, and other compounds of chlorine; the oxide of tin meanwhile passing through the several processes, remains with little loss in the insoluble residue, chemically unchanged. The chlorides of copper and silver, being more stable compounds than chloride of iron, they remain in that condition after the chloride of iron has been decomposed, in which state they are readily separated from their solution by the action of metallic iron. In decomposing the carbonate of lime to produce caustic lime, large volumes of carbonic acid are evolved. This is used to combine with the soda forming the carbonate of soda. Sulphate of soda, caustic lime, and coal, are mixed together in the process of manufacturing alkali. On the mixture being exposed to a current of heated air, the coal ignites, and taking oxygen from the lime, sulphuric acid, and soda, produces carbonate and caustic soda, and sulphide of sodium and calcium. The solution obtained from this product is brought into contact with the carbonic acid of the lime-kiln, which readily unites with the soda, decomposing the sulphide of sodium, and thus forming the soda of commerce.

Mr. Longmaid states the advantages resulting from the use of these processes to be as follows:—1. The saving of at least four pounds per ton in the manufacture of soda, which, taking the annual production of this alkali in Great Britain at 120,000 tons, would give £480,000. (2.) The recovery of the silver lost in the copper smelting works, which, at a moderate estimate, he calculates at 1,500,000 ounces. The saving effected in the smelting charges on copper, the recovery of the tin, oxide of iron and chlorine are also very important items in the account. Mr. Longmaid estimates the aggregate advantage at £1,000,000 sterling per annum, besides bringing into use large quantities of ore too poor to be worked on the present plan, and benefiting the general trade, commerce, and agriculture of the country, by the reduced cost at which the soda is thus produced. We may mention, that in addition to the works at St. Helen's, which are capable of treating from 8,000 to 10,000 tons of ore annually, similar works are in course of erection on the Tyne.—*Pharmaceutical Journal.*

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III. PHARMACY, MATERIA MEDICA, THERAPEUTICS &c.

REPORT MADE TO THE ACADEMY OF MEDICINE ON THE SUBSTITUTION OF AN ARTIFICIAL IODISED OIL FOR COD LIVER OIL.

BY A COMMITTEE COMPOSED OF MM. GIBERT, RICORD, SOUBEIRAN AND GUIBOURT (REPORTER.)

(*Concluded from page* 89.)

We shall now proceed to the consideration of the note of M. Deschamps, sent to the Academy on the 31st August, 1850, eleven days after the presentation of the memoir by M. Personne. This note is likewise on the subject of *the preparation of an iodised oil, intended to replace cod liver oil.* We find in it the results of numerous experiments the products of which were sent to the committee, and which could not have been made during the time which intervened between the presentation of the two papers. The result has been a conviction in our minds that M. Deschamps, unacquainted with the Work of M. Personne, was employed in finding a substitute for cod liver oil. We can, therefore, concede to M. Personne only the priority of presentation.

M. Deschamps has caused iodine to act on oil of sweet almonds, and even on olive oil, in proportions varying from 1 to 56 per cent., and he has done so both directly and by the intermedium of alcohol. A certain number of peculiar products have thence resulted, which may become very interesting, but the examination of which is not yet concluded, and to which the author proposes returning. For this reason we think that we ought not to employ the time of the Academy with them, and we confine ourselves to making known the process by means of which M. Deschamps prepares his *medicinal iodised oil.*

℞ Oil of sweet almonds 100 grms.
Alcoholic solution of iodine (at 12 per cent.) 24

Pour the mixture into a retort, introduce into it a leaf of platinum, and distil carefully until the oil is decolored; withdraw the liquid from the retort, wash it first with water containing one-thousandth of its weight of bicarbonate of soda; afterwards with pure water. Separate the oil, agitate it with two grammes of starch, heat in a sand bath for an hour, filter and preserve it.

100 grammes of this oil contain, according to the analysis of M. Deschamps, 52 centigrammes of iodine, that is to say, the same proportion as that of M. Personne, although the quantity of iodine dissolved in the alcohol is double that used by the latter chemist. This is explained by the peculiar action exerted by iodine on alcohol, and by a necessarily more considerable formation of hydriodic acid. Moreover, the author advises the analysis of a small quantity of oil after each operation, so as to be more certain of the proportion of iodine contained in it.

The oil thus prepared, as well as that of M. Personne, differs but little from oil of sweet almonds, either in color or taste, and is easily administered to patients, either pure or made into an emulsion with gum. We consider these two oils as identical; but as the process of preparation given by M. Personne is not complicated by the action of alcohol, and as it should produce more readily an always uniform medicament, we think that it should be preferred.

Before going into the therapeutical properties of this oil, we must pay attention to the claim of priority set up by M. Marchal (of Caloi). In this claim, M. Marchal quotes an article by Dr. Foucard, inserted in the *Gazette des Hôpitaux* of the 1st February, 1848; and it is indeed in this article that we find the proof of the fact advanced.

It is therein seen that M. Marchal, starting from this fact, incontestible in his opinion, but very contestible in ours, that cod liver oil owes its properties to iodine, and *iodine alone,* has wished to substitute for it an artificially iodised oil, containing a much larger quantity of iodine. We find likewise that M. Marchal, in proposing this medicament, depends on this, that iodine dissolved in an assimilable organic substance, should be retained longer in the economy, and should act more efficaciously as a medicament, than when it is administered as simple or ioduretted iodide of potassium. Thirdly, M. Marchal has chosen a fat substance as excipient, because substances of this nature are directed immediately into the small intestine where they are formed into an emulsion by the bile,*

* We should now say by the pancreatic juice.

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which relieves the stomach; very important circumstances when we speak of so powerful a substance as iodine. M. Marchal can therefore administer 30 centigrammes of iodine in a day under this form, whereas 5 centigrammes, introduced into the stomach in the state of alcoholic or aqueous solution, cause a very intense irritation of this organ. This observation is confirmed by M. Gibert, a member of the committee, who thus expresses himself on the subject of the experiments on iodised oil tried in the hospital of Saint Louis :—

"The first result of these trials, that which is the most striking, is the possibility of thus administering very considerable doses of iodine without the manifestation of any poisonous effects. Whilst it is impossible to use iodine dissolved in iodide of potassium, in a daily dose of from 5 to 10 centigrammes, without the appearance of symptoms of gastro-intestinal irritation, we can, without inconvenience, administer 10 to 12 grammes of M. Deschamp's *brown iodised oil*,* and the *colorless iodised oil*, which is that most frequently administered, may be given in a dose representing from 20 to 30 centigrammes of iodine, without producing any immediately apparent effect. However, the secretions from the body, and especially the saliva, show the presence of iodine after the very first doses."

The iodised oil of M. Marchal is prepared by dissolving 5 parts of iodine in 100 parts of oil of sweet almonds. The dissolution should take place on the very dayon which it is wanted for use and not before, as, after a very short time, the oil changes its color, which proves that some alteration takes place, of which we do not know the nature. The iodised oil may be given in the natural state, but it is better made into an emulsion. Finally, the dose is from 1 to 6 grammes each day; this last dose, which represents 30 centigrammes of iodine, should not be exceeded.

We have now given an analysis of the note inserted in the *Gazette des Hôpitaux* of the 1st February, 1848. The result is, that M. Marchal is proved to have been in advance of MM. Personne and Deschamps in the idea of substituting an artificial iodised oil for cod liver oil. He likewise appears to have been the first to apply this iodised oil to the resolution of ganglionic swellings, for the cure of all scrofulous symptoms (ophthalmia, dermatosis, adenitis, ostëitis, &c.), and of tertiary symptoms of syphilis, which appear to him as forming a transition state between syphilis and scrofula; but we must, more than ever, make the remark that an oil containing 1,750 times more iodine than cod liver oil cannot be compared with it; and that it is an entirely separate medicament, undoubtedly eminently useful, but which should not be confounded with cod liver oil.

We must now exculpate M. Personne from the accusation brought against him by M. Marchal, of having been aware of the composition and application of his iodised oil, which is used in the practice of M. Ricord, at the *Hspital du Midi*, of which he, M. Personne, is the head pharmaceutist, of having said nothing about it, and of having thus wished to attribute to himself the priority of the idea, and of the application of this medicament. (See the *Gazette des Hôpitaux*, Sept. 12, 1850.

To this M. Personne replies, that having been pharmaceutist to the *Hôpital du Midi* only for one year, he had not seen the *Gazette des Hôspitaux* of 1848, and that the only formula which he found in use at the *Hôpital du Midi*, on his taking office was transcribed in the following manner in the register of the establishment:—

IODISED EMULSION (PRACTICE OF M. RICORD).

℞ Oil of sweet almonds ..... 30 gram.
Syrup diacodium ..... 30 "
Gum arabic..... 15 "
Water q.s. to form 125 grammes of emulsion.

Add:
Tincture of iodine ..... 4 gram.

Whence came this formula? M. Personne does not know, but it was the only one in use at the *Hôpital du Midi*; it is neither like the iodised oil of M. Marchal nor cod liver oil; it has besides every inconvenience connected with the internal administration of the alcoholic tincture of iodine. It was therefore useful to substitute for it a preparation more analogous to cod liver oil. M. Personne has endeavoured to do so, and we think that he has succeeded.

On the other hand we must remark on the great difference existing between the iodised oil of M. Marchal and that of M. Personne. The first contains all the iodine employed, even to a twentieth of its weight. M. Marchal has, however, observed, that

* Prepared by the direct action of one part of iodine on ten parts of oil, and retaining after the washing, according to the analysis of M. Deschamps, 8 per cent of iodine.

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this iodine reacts on the oil, which renders the composition variable; but to avoid this variation, he recommends using the iodised oil on the very day of its preparation, which renders it always certain, and which is one reason that the iodine, being for the most part only dissolved in the oil, should act directly on the digestive organs and retain a portion of its irritating action. We should even say, that if M. Marchal has been able, without inconvenience, to use constantly and daily 30 centigrammes of iodine dissolved in oil, it is probably because his recommendation of preparing the medicament each day, has not been exactly followed, and consequently the oil was often used several days after its preparation.

M. Personne, on the contrary (and what we say applies equally to M. Deschamps), has wished to ascertain, as was his duty as a pharmaceutist, what passes between the oil and the iodine; and to avoid the inequality of action caused by time, he carries the chemical reaction to its furthest limit; he disembarrasses himself from all that is foreign to the elementary combination of iodised oil, and has formed a veritable officinal medicament, stable in its composition, and capable of being preserved for a long time.

Two members of the committee have subjected to experiment the iodised oils of MM. Personne and Deschamps. M. Gibert has experimented especially on the oil prepared by M. Deschamps; M. Ricord has employed exclusively that prepared by M. Personne.

M. Gibert has administered during a time which varied from a few weeks to several months, iodised oil to various patients attacked with dartrous affections or scrofulous swellings.

In several cases of chronic impetigo, the white iodised oil of M. Deschamps, used simultaneously internally and externally, quickly caused the disappearance of the eruption; more rapidly than cod liver oil would have done, and as it is far easier of administration, it offers in similar, cases a real advantage.

In two cases of esthiomene of an erythematous form, it likewise appeared to possess a resolutive quality; but here, as the complaint offered much more resistance, it did not succeed in making a complete cure.

Finally it failed with several scrofulous glandular swellings which had likewise resisted cod liver oil.

To sum up, M. Gibert does not think his experiments sufficiently numerous, or of sufficient duration for him to be able to pronounce on the absolute value of iodised oil as a specific in dartrons and scrofulous diseases, but they will suffice to establish that this medicament, easy of administration and deprived of all hurtful qualities, is possessed of a resolutive action which may be rendered useful in certain crhonic eruptions, and in certain glandular swellings.

During a year, M. Ricord has used iodised oil in a great number of scrofulous affections of which the greater part, often represented as venereal, presented themselves at his consultation, and which he was forced to take under his care. In this manner he has excellent results in the treatment of strumous buboes, tuberculous epididymitis; in some cases of scrofulous swelling of the articulations, &c., *ceteris paribus* in curable cases, the cure, or at any rate modifications for the better, have been more quickly obtained with iodised oil than with cod liver oil. From all the observations which have been collected, we shall only cite one which is very remarkable both in an etiological and therapeutical point of view.

"Dubuy (Azarie), aged fifteen years and a half, entered on the 3rd December, 1850. On his entrance this child had a very extensive fistulous opening in the middle of the external part of the right thigh, with apparent swelling of the femur, of ten years standing. A probe introduced into the fistula did not penetrate to the bone, and was arrested by a spongy, hard, thickened tissue. (Diagnostic *Chronic periostitis.*) The coxo-femoral articulation and that of the knee were healthy; walking was, however, impossible; the patient had used crutches for several years; the corresponding member was atrophied."

In looking for the cause of the complaint, hereditary scrofula was soon established. The following was the account procured of the father's former life:—

"Dubuy, Louis Jacques, aged fifty-three years, had had in 1823 a chancre for which he took 40 doses of mercurial liquor, and 10 packets of pills. This treatment lasted for several months.

"In 1847, he perceived a tumor on the level of the right hypocondre, accompanied with pain on pressure and during the respiratory movements. This tumor was cured in six weeks by treatment with Van Swieten's liquor. Some time after, Dubuy had an ulceration of the velum palati, with a perforation of the vault of the palat. and destruction of the uvula. Cauterised with lapis infernalis and treated by the liquor of Van Swieten, in one of the hospitals of Paris, he remained there four months, without obtaining any amelioration. Having returned home with a swelling of the lower part of

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the right leg, he was cauterised with red hot iron. Several pieces of bone were eliminated.

"Finally, in 1849, Dubuy was four months under M. Ricord; he was subjected to a treatment by iodide of potassium, iodised gargles, vapor baths and applications of Vigo plaster on the foot. He came out completely cured.

"This man is the father of six children, born in 1820, 1821, 1825, 1827, 1828, and 1835. The first five are healthy; the last only (Azarie) has been attacked with an affection of the femur for which he was admitted among M. Ricord's patients on the 3rd December, 1850.

"This child took at first cod liver oil, 60 grms. each day; he could not endure it, threw it up several times, and up to the 2nd January no amelioration had taken place. On the 3rd January, the use of iodised oil was begun, 60 grms. daily; the child retained this new medicament perfectly, and continued it until the 10th February, on which day he left; at this time the fistulous opening was closed; the thickening of the tissues was considerably diminished; walking was almost easy; the member which the patient had not been able to use for some years was only rather weak; the general health was satisfactory. The child had gained flesh, his skin was firmer and had more color.

"M. Pusch, who has made the same experiments as M. Ricord, authorises him to say that the results agreed with his.

"The average dose of iodised oil was 60 grammes but it was often carried to 100. In general patients take it readily. It is only in exceptional cases and when the dose is very large that vomiting, colic, or diarrhœa are observed. Observing that prudence which ought to govern the administration of all remedies, studying the degree of susceptibility of the patient, and the special conditions of the case, iodised oil is a very valuable medicament and presents many advantages over cod liver oil."

After this evidence, given by two medical practitioners forming part of the committee, we propose the following conclusions. The first two, being merely an epitome of chemical facts, do not appear to us to require any deliberation on the part of the Academy; these are opinions given by the Committee. The last two, recognising personal facts, the declaration or decision of the Academy, should be submitted to its decision.

1st. The quantity of iodine contained in cod liver oil appears to be much smaller than the first analyses led us to suppose. This quantity is so small that it is difficult to attribute to it any considerable part in the action of the medicament.

2nd. Pure and filtered cod liver oil does not appear to contain phosphorus. This body may, therefore, be regarded as foreign to the medical action of the oil.

3rd. The Academy acknowledges M. Marchal (of Calvi) as the first who had the idea of the use in medicine of an artificial iodised oil. It considers that the formula and the mode of preparation proposed by M. Personne are preferable to the others and should be adopted, at least for the present.

4th. The Academy thanks MM. Personne, Deschamps, and Marchal (of Calvi) for having by their useful communications, called its attention to medicaments which it perceives to be of great importance in the art of curing.

The last two conclusions are sanctioned by the Academy.—*Journal de Pharmacie et de Chimie*, September, 1851.

RESEARCHES ON THE MODIFICATIONS CAUSED IN THE ANIMAL TEMPERATURE, BY THE INTRODUCTION INTO THE ECONOMY, OF VARIOUS THERAPEUTICAL AGENTS.

Fifth Memoir.

BY MM. AUG. DUMERIL, DEMARQUAY, AND LECOINTE.

I. The first fact which our experiments demonstrate, relates to the evident modifications which a great number of medicaments, introduced into the digestive organs, or into the circulation, cause in the animal temperature. Under the influence of some, indeed, it is depressed, whilst, under the influence of certain others, it is augmented, and most frequently, within such limits as may easily be appreciated with the aid of a thermometer.

II. Of these two phenomena, increase or diminution of heat, sudden or gradual, from the commencement of the experiment to the end, the first was more rarely noticed than the second.

III. The oscillations have frequently given us, during the course of several experiments, the measure sometimes of the progress of the action produced by medicaments on the economy, sometimes of the more or less energetic resistance of the vital force to the disturbance caused in it. Thus, the temperature, after being increased 1 degree, may diminish as much or more, and then return to its original number, or even go beyond it. These oscillations are a mani-

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fest proof of the influence which medicaments exert on the calorification.

IV. After having noticed this frequently irregular progress of the phenomena under consideration, we have studied their definitive effects, in order to solve this question —within what limits does the proper temperature of animals vary?

A. The conclusions relative to *the diminution of animal temperature* under the influence of therapeutical agents, may be thus deduced from our experiments:—

1. Beyond 4° centigrade (7° 2′ F.) the cooling is mortal.

2. It is most frequently mortal at 3° centigrade (5°4′ F.) when the vital reaction is not very powerful. If, on the contrary, this reaction is sudden and rapid, the animal resists.

If the poison is very energetic, death may sometimes occur despite this reaction to which, then, a fresh abatement succeeds.

4. Finally, the violence and rapidity of the phenomena of poisoning may be so great, that death may take place before the complete manifestation of the disturbance of the animal temperature. In such, but truly exceptional, circumstances, we have seen the animal die with a diminution of scarcely 2° centigrade (3° 6′ F.), the effects of which would not have been feared, if the substance had been less active, or given in smaller dose.

B. With regard to the *elevation of temperature* in animals experimented on by us, the conclusions are as follow:—

1. It has never been comparable to its diminution. Thus, the administration of the most varied medicaments, and in the most various doses, has not, in any case, raised the mercury more than 2° 9′ centigrade (5° 22′ F.), above its original degree; and even this degree was noted only once. Eleven times only, in the 25 experiments which our work contains, it varied between 2° C. (3° 6′ F.) and 2° 7′ C. (4° 86′ F.); it was more frequently below these numbers. Calorification cannot therefore be augmented as much as it can be depressed.

2. A slight increase of temperature has several times preceded death; it is, therefore, an alarming sign, since, in limits much more confined than those of its abatement, it may lead to a fatal issue.

V. Taking account only of their action on animal heat, medicaments may be divided into three categories.

a. The first comprises those which, in every dose, increase it; such are, for example, some of the substances called alteratives, such as iodide of potassium, and all those which belong to the class of excitants, as our frequently repeated experiments with strychnia, ergot of rye, phosphorus, cantharides, sulphate of quinine, cinnamon, and acetate of ammonia, have shown us.

b. In the second category must be included all the pharmaceutical products which have the constant effect, in various doses, of diminishing the animal heat, that is to say, among alteratives, iodine and corrosive sublimate; among the evacuants, sulphate of copper, which is an energetic emetic; and all the stupifiants, such as cyanide of potassium, codeïa, acetate of morphia, laudanum, belladonna, and its active principle, atropine, hyosciamus, and Datura Stramonium.

c. In the third category, we comprise the substances which exert on calorification a variable action according to the doses employed. The purgatives whose action is most prompt (colocynth, gamboge, croton oil), administered in doses which are not poisonous; increase the temperature, after having depressed it for the first two or three hours; but this depression is gradual and permanent until the end, with quantities which are necessarily mortal. It is the same with arsenious acid.

The substances which, in this category, present most interest, are, tartar emetic, and ipecacuanha. From 5 to 10 centigrammes of the first of these emetics, increase the heat, which is powerfully depressed, on the contrary, when these numbers are exceeded, and when 50 centigrammes are given. With ipecacuanha, the effects are reversed. It is true that its mode of action, although it is likewise an emetic, is certainly different, as is proved by the use which the physician makes of it in many special cases.

VI. Among the medicaments which modify caloricity, either by exciting or depressing it, there are some whose rapidity is very striking; these are particularly the stupifiants, whose influence on the nervous system is so remarkable, as M. Flourens' experiments have proved, in which laudanum was directly applied on the lobes of the brain and on the cerebellum.

VII. It is right to compare with this observation a fact which our numerous post mortem examinations have revealed to us. This fact, which seems to us well worthy of fixing the attention of physiologists, consists in the peculiar aspect presented by the nervous ganglious of the great sympathetic nerve. After five experiments with corrosive sublimate, all characterised often by very considerable cooling of the animal, and all followed by death, the tissue of these ganglia was manifestly injected. In the

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same way, other medicaments, which have powerfully depressed the calorification, have produced hyperæmia of the nervous ganglia. We have, indeed, noted it twenty-three times, in thirty-three cases in which this depression was proved.

Finding thus, about twice in three times, a special and always identical state of the nervous ganglia in animals in which cooling has been one of the symptoms following the administration of certain medicaments, are we not warranted in enquiring if this nervous system does not perform an important part in the production of animal heat.

Considering, as we ought to do, that the focus of the animal heat is not concentrated in the pulmonary apparatus, but that it is disseminated in all the points of the organism, in which there is effected in the blood a continual exchange of oxygen and carbonic acid, it must necessarily be acknowledged that this act which is accomplished in the interior of the tissues, can be fully exercised only under a nervous influence. Now, whence could this indispensable influence emanate, unless from the ganglionic nervous system, which may be regarded as the regulator of the vital functions of nutrition? If the ganglia from which emerge the numerous filaments connected with each of the arterial ramifications, undergo a pathological alteration, calculated to clog their functional action relative to the interstitial nutrition over which they preside, and which occupy so important a place in the accomplishment of the vital acts, calorification can no longer be produced except in an imperfect manner. This supposition is almost entirely confirmed by our experiments, the results of which tend to attribute to the nervous influx of the great sympathetic nerve, as M. Chossat has already asserted, a great part in the production of animal heat.—*Comptes Rendus*, No. 16, October 20, 1851.

REMARKS ON SEVERAL SYRUPS.

BY M. E. MOUCHON.

(*Concluded from page* 91.

SYRUP OF CARROT.

In June, 1842, I took 9,000 grammes of rasped carrot; I extracted the juice, of which the weight was 4,500 grammes, or half that of the roots. This juice, when filtered was evaporated to 28 degrees of concentration, as I direct in my Monograph; but it was so much deprived of saccharine matter, that it only yielded me 220 gr. of thick extractive matter, of a deep brown and but slightly saccharine. It was necessary to dilute it with a very large quantity of sugar syrup, to give it the appearance and taste of a syrup of carrot prepared at the proper season, that is, at the end of autumn or beginning of winter, with carrots of the first year, this period being the only one favorable to the preparation of this product, when we wish to follow the process which I advise in my work.

I own, that though I ought to have expected to be deceived at such a season, I did hope to have obtained more satisfactory results; nevertheless, as there results from this fact another datum confirming those we had already, I ought to console myself easily for this mistake, and with the more reason that I shall not have to expose myself to it again. Besides, we must remember that the carrot undergoes, during the different phases of its vegetation, certain modifications which are inappreciable, and which render these data very uncertain. Witness the fact which I mention in my treatise of a 32nd of product resulting from the concentration of the juice of carrots of the second year; and I could also mention other facts which would prove that these vegetable parts furnish very variable quantities of saccharine matter, even when taken in the best circumstances of the year, remembering that it is even then a chance if they give a sixteenth of syrup.

I mention this without attaching any great importance to the medical properties of the syrup of carrot; for if this medicament has any efficacy it must necessarily be only when the active principles are in as concentrated a state as I prescribe, and not diluted with the mass of syrup required by the ordinary process. It may be objected that there is nothing pleasant to the palate in the sugar thus reduced into syrup; but this objection ought to fall to the ground in the presence of a necessity commanded by the authority of a medical indication, especially as this syrup, which may, if desired, be diluted by an equal quantity of sugar syrup, can only inspire disgust in very delicate persons.

SYRUP OF THE WATER HEMLOCK, OR PHELLANDRIUM.

Seed of the *Phellandrium aquaticum*	125
Boiling water	q. s.
Simple syrup	4,000

Proceed to two successive infusions, so as to collect about 4,500 grammes of filtered infusion, which is to be added to the syrup by degrees, when it has attained a high degree of concentration; when the balance

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gives but 4,000 grammes of syrup the operation is concluded.

Two infusions are not too much for the seeds of the *Phellandrium*, as a third proves, by the passable color of the infusion that the exhaustion of the vegetable is still incomplete.

One thirty-second part of the base appears to me to be sufficient to give to this syrup the energy it ought to have, especially when we have recourse to a second infusion, the characters presented by the second infusion being almost as distinct as the first.

I consider, therefore, that the proportions which I have adopted are preferable to those given in the formula of M. Mialhe. Moreover, a second infusion, which it would be perhaps as well to follow with a third, to render the exhaustion more complete, enables us to reckon on an almost fixed basis which is 1 gramme in 32; whilst it is not correct to think that 30 grammes of M. Mialhe's syrup represent 3 grammes (one-tenth) of seed since I have proved that one single infusion, with the three parts of boiling water used by that gentleman, do not remove half that amount.

The recent communication made by M. Chatin to the Academy of Sciences in favor of fresh-water plants, and in particular of the *Phellandrium*, seems fully to justify any efforts to render this valuable umbellifera a favorite. It is on this account, and besides to satisfy the demand which there has for some time been for syrup of *Phellandrium* that I have judged it right to establish the simple and rational formula which I give here.

If what is written in favor of the *Phellandrinm aquaticum* be anything like truth, such a formula ought to receive a hearty welcome from the medical public, this agent appearing likely to be of service in more than one way in certain pulmonary affections which have always been considered to be beyond the reach of medicine.

SYRUP OF BINIODIDE OF MERCURY, OR IODHYDRARGYRIDE OF POTASSIUM.

	Gr.
Biniodide of mercury	5
Iodide of potassium	10
Distilled water	35
Simple syrup.....	2,450

Triturate the two iodides together, add the distilled water, and filter the saline solution through paper, so as to add the cold syrup by intimate mixing.

A table spoonful of this syrup (about 30 grs.) contains the two salts in the dose of 5 and 10 centigrammes, whilst that of M. Boutigny, introduced into practice by Dr. Gibert, represents them in the proportions of 1 and 50.

It appears to me that the syrup of which I publish the formula merits its name better than that of M. Boutigny, which would, in my opinion, be better designated syrup of iodide of potassium, in consequence of the comparative quantity of the alkaline iodide.

Two parts of this salt suffice to cause the solution of one part of the mercurial salt. This latter, moreover, exists in such a proportion that the syrup may be taken in the dose of 16 or 32 grammes, when the iodide of mercury is intended to constitute the basis of a mercurial treatment.

Moreover, it would be easy to do entirely without the iodide of potassium, and merely to dissolve the salt of mercury in a sufficient quantity of alcohol, if the solution is to be mixed with simple syrup, no chemical influence being able to alter the nature of this base, which certain compound syrups can and will decompose, in the absence of iodide of potassium.

The iodhydrargyride of potassium, discovered by Polydore Boullay, and tried with the greatest success by Dr. Puche, physician to the *Hospital du Midi*, might likewise form the basis of a syrup, without fear of decomposition, as has been proved by M. Lepage, a distinguished pharmaceutist at Gisors. This chemical compound being the result of the combination of equal parts of iodide of mercury and iodide of potassium, according to the useful modification proposed by Dr. Puche, it would constitute a syrup nearly analogous to that of which I have given the formula.

SYRUP OF GUM TRAGACANTH.

It was in the year 1829 that I published, for the first time, the formula for syrup of gum tragacanth which figures, with slight modification in the *Traité des Saccharolés*. This modification is, in fact, only in the quantity of gum used, experience having taught me the value of a reduction which fixes the proportion of this substance at half that mentioned in the *Traité*, retaining the whole quantity of water prescribed for the tumifaction of the gum, and devoting three days instead of two to the formation of the mucilage. I have adopted the following proportions:—

Gum tragacanth	15 gram.
Water	1 kilo.
Simple syrup	3 "

The syrup of gum tragacanth, thus modified is sufficiently mucilaginous; it is more homogeneous, by reason of the greater division of the gummy matter in

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general, and the tragacanth in particular; it cannot be compared to anything so well as to a well prepared syrup of gum arabic, in which the proportion of the medical agent is carried to its greatest limit.

This reduction might be applied to several analogous syrups. Thus the syrup of *fucus crispus*, the formula for which I have given in a separate memoir, those of snail, Iceland moss, and gelatine bear it well. Pearl moss and lichens properly exhausted, furnish sufficient mucilaginous matter to give to these syrups, reduced to 50 per cent. of each base ordered in the *Traité*, the characters which they ought to possess. As for gelatine, it is of such a nature that every thing which is applicable to the mucilaginous syrups in question applies equally to it, these various products being all successfully included in the same modification.—*Repertorie de Pharmacie*, October, 1851.

POISONING BY CAMPHOR ADMINISTERED AS A LAVEMENT.

We think it right to publish a portion of the Report of the *Société Médicale des Hôpitaux de Paris* which contains this case of poisoning and the observations suggested by its communication. We consider that all that concerns this much used medicament will be interesting to our readers.

"M. Aran communicates to the Society a case of poisoning by 4 grammes of camphor administered in a lavement. I think it all the more useful, he says, to lay this case before the Society, because the quantity which I employed, and which produced the poisonous effects which I am about to detail, is precisely that recommended in the most recent formularies and works on therapeutics. I have under my charge at this moment in the *Hôpital Necker* a young woman, twenty-seven years of age, who presents very varied nervous and dyspeptic symptoms, without being either hysterical or epileptic, and to whom, after having tried many different means, tonics, ferroguious preparations, anti-spasmodics, valerian, assafetida, &c., I resolved to administer camphor. Yesterday morning I prescribed 4 grammes of camphor in a lavement; two minutes after its administration the patient complained of a sensation of faintness and a pain in the abdomen; she was then attacked by a violent convulsion with loss of consciousness, frothing at the mouth, contortions of the limbs, throwing back of the head, cyanosis of the face, coldness of the extremities, sinking of the pulse, extreme difficulty of respiration. This attack lasted twelve or fifteen minutes. The patient was restored to consciousness by throwing cold water in her face; but she complained of a sensation of suffocation, saying that she was going to die. After having given a purgative lavement to evacuate what remained in the intestine of the camphor lavement, stimulating frictions were used to the limbs, and an infusion of coffee was administered from time to time. Still the symptoms did not diminish, the respiration appeared to become more difficult and the pulse weaken. Under these circumstances, M. Aran caused the patient to be placed on a tressle bed; the body was covered with sinapisms sprinkled with liquor ammoniæ, and for twenty minutes a small stream of cold water was kept pouring on the head, at the same time mouthfuls of coffee were continually administered. The affusions calmed the agitation and anxiety of the patient, who, however, continued to complain of difficulty of respiration and to say that she was going to die. The pulse became perceptibly stronger, and the skin reddened under the influence of the sinapisms, although the patient was quite unconscious of their presence. An hour or an hour and a half after the accident the patient was placed in a very hot bed and covered with hot blankets, which were constantly renewed, and the heat of which she scarcely perceived. The coffee was continued for a quarter or half an hour, although the patient occasionally vomited it; it was then replaced by a cordial draught of tincture of cinnamon. The skin became warm and was even the seat of great heat; the face and feet continued cold for a long time; however, thanks to this treatment and a lavement of coffee, the patient was out of danger four hours after the administration of the lavement. She was feverish all day yesterday, and to-day there only remains weakness and heaviness. She remembers nothing that happened to her after the administration of the lavement until she was placed on the tressle bed.

"It appears to me," adds M. Aran, "that we may draw much useful information from this case. The first is, that the dose of camphor prescribed for lavements in the formularies is too high. This is not the first time, as I have discovered by some researches which I have since made, that analogous symptoms have occurred after the administration in lavements of 6, 4, and 2 grammes of camphor to adults, and 50 centigrammes to children. M. Orfila, in his *Traité de Toxicologie*, M. Marcel Petiteau, in the French medical journals, M. Dieu, in

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his *Traité de Thérapeutique*, have cited cases that prove with what hesitation we ought to administer camphor in lavements, at least in large doses."

As to the mode of action of camphor, M. Aran affirms that after being a witness to the sufferings of his patient, and comparing them with analogous facts known in science, and in particular with experiments made upon himself by Alexander, it is impossible not to admit that camphor is an eminently hyposthenisant agent. Although admitting the proofs of the Italian School, M. Aran declares that he did not dare to administer according to the example of this school, a large dose of opium to counteract the poisonous effects of the camphor, and that he adhered to the means generally recommended in poisoning by acro-narcotics. He has nevertheless had no cause to repent of so doing. Coffee appeared to succeed very well, notwithstanding the opinion of Phœbus, who thought that this medicament augmented the poisonous effects of camphor. It is the same with wine. But the means to which M. Aran wishes principally to call attention, those which appear to him the most useful, are the affusions of cold water continued perseveringly, in the same manner as they are employed in many other descriptions of poisoning, especially in poisoning by hydrocyanic acid. Under their influence the respiratory anxiety is perceptibly modified, and the circulation is raised at the same time that the respiration becomes more easy.

"M. TROUSSEAU regrets having omitted, in the last edition of his *Traité de Thérapeutique*, several facts analogous to that of M. Aran, and which he had likewise observed. Thus he once gave 10 drops only of camphorated alcohol in 100 grammes of water for a lavement, and, five or six minutes afterwards very serious symptoms manifested themselves. By the mouth, he has been able, on the contrary, to give from 1 to 4 grammes of camphor without any appreciable effect. M. Pidoux has himself taken 2 grammes with impunity in several experiments. Similar differences of action have likewise been noticed in the experiments of Jœrg and in the observations of M. Gendrin.

"M. BRICHETEAU thinks these differences of action, in camphor as in other medicaments, depend principally on idiosyncrasies. As to the administration of camphor, 4 grammes appears to him too strong a dose; he saw poisonous effects developed in a young man of the *Collège Stanislas*, to whom Laennec had likewise ordered 4 grammes; he prescribes it, in typhoïd fevers, in the dose of only 1 gramme.

"In the case of a patient attacked with rheumatism, to whom he administered 50 centigrammes of sulphate of quinine in solution, serious phenomena of poisoning manifested themselves, the rheumatism in the meanwhile diminishing considerably; a relapse took place; the same quantity of salt was taken without any appreciable accident, and the relief was not less.

"M. GENDRIN establishes a great difference in the activity of medicaments if administered by the mouth or by the rectum. To cite an example, he prescribes essence of turpentine in the dose of from 15 to 30 grammes by the stomach; in a lavement he orders only from 8 to 12 grammes. A patient took one day in a lavement 12 grammes of this substance which he ought to have swallowed, and very grave phenomena resulted from it."—*Journal de Chimie Médicale*, Nov., 1851.

ON THE ESSENCE OF ROSES.

M. SERVANT has given us the following information respecting essence of roses. On the 9th of June, 1851, 75 kilogrammes of roses of Puteaux were distilled by steam; 75 quarts of distilled water were obtained. The small quantity of essence of roses resulting from this distillation was collected with care by means of an eolipile, it was put into a test glass; it was brown, brilliant, crystallised in small plates, treated by highly rectified sulphuric ether, the liquor was filtered, evaporated in a porcelain capsule, first in the open air, afterwards in a sand bath to drive off the whole of the ether. The essence obtained, poured out while still warm, into a tube with a foot, weighed a little more than two grammes; in a few minutes the essence solidified. In this state it is limpid, colorless, transparent, very aromatic, with an extremely sweet odor; it resembles congealed water sprinkled with small acicular crystals; it remains in the solid state at 68° F.

Essence of roses is then found in the flowers in a proportion approximating to one thirty-seven thousandth, abstracting that contained in the distilled water, which is very odoriferous.

According to these data 37,500 pounds of roses would be required to obtain 500 grammes of essences. Roses having cost on the 9th June of this year 40 francs the 50 kilogrammes, the cost of the flowers may be calculated at 15,000 francs. Supposing that in an ordinary alembic we could distil 50 kilogrammes per day, it would require 375 days for the total distillation of these flowers. Supposing again the fuel and cost

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of distillation may come to abont 3,000 francs, the total price of the essence of roses would be 18,000 francs, or 1,127 francs the 30 grammes. If, however, we had no other aim than to obtain the essence of roses, neglecting the distilled water, we should certainly collect a much greater quantity by distilling the water with fresh flowers; if, even, we distil without the aid of steam, the proportion of essence will be much greater than that which we have obtained, for the venerable Baumé distilled, in June, 1771, seventy-five pounds of rose flowers, which gave him one drachm of essence slightly rose colored.

However small may be the quantity of essence of roses which we have obtained this year, it is nevertheless very superior to that collected last year. A hundred kilogrammes of roses distilled by the same process, in the same alembic, furnished so small a quantity of essence that we did not take the trouble to collect it. In 1846, on the contrary, ninety-six kilogrammes, gave nearly ten grammes of essence.

The commercial essence of roses brought from the East, is ordinarily sold at from 28 to 30 francs for 30 grammes. Although roses are cultivated to an immense extent in that country, and contain more essence than the French ones, and althongh hand labor costs next to nothing, it is, nevertheless probable that the essence sent to us is never in a state of absolute purity, and that it is probably mixed with essences of a lower price and the odor of which resembles that of roses.—*Journal de Chimie Médicale*, Nov., 1851.

NOTE ON THE SYMPTOMS AFFECTING WORKMEN WHO MANUFACTURE CHROMATE OF POTASSA.

BY MM. BÉCOURT AND A. CHEVALLIER.

From the facts contained in this memoir, it results :—

1. That the men who work at the preparation of bichromate of potassa are subject to peculiar symptoms.

2. That these symptoms affect those workmen who do not take snuff, and that the mucous membrane of the nose is destroyed.

3. That those who take snuff do not experience the same symptoms.

4. That the workmen who have their skin exposed, in some parts, are violently attacked when the bichromate is in contact with those parts, and that they should take care to preserve them from contact with the solution of bichromate of potassa.

5. That the workmen who are too slightly clad are also exposed to some inconveniences which we have noticed, and which may easily be avoided.

6. That animals, like men, are exposed to the inconveniences caused by bichromate of potassa.

With the intention of continuing our researches on the question which we have just treated, and on the means which may be put in practice for preventing and remedying, we have requested information on the subject from England and Germany; we shall hereafter communicate to the Academy any facts which merit notice.—*Comptes Rendus*, No. 14, October 6, 1851.

NEW EXPERIMENTS ON NICOTINE.

BY M. VLEMINCKX.

Some experiments made by M. Vleminckx, of Brussels, on two sparrows, a cock, a rabbit, two dogs and a cat, have led the author to the following conclusions.

1. The animals poisoned fell indifferently on the right side and on the left.

2. The poisoning is more active by the mucous membrane of the eye than by that of the digestive tube.

3. The most remarkable and most frequent anatomical lesions are congestion of the vessels of the pia-mater and especially intense congestion of the lungs.

The first two conclusions follow à priori from the physiological data. Indeed the nervous system being equal and perfectly symmetrical, how can there be more tendency to action on one side than on the other? And as to the second, the ocular mucous membrane, being covered neither with a layer of mucous nor with a thick epithelium like the digestive mucous membrane, should absorb more rapidly.—*Presse Médicale Belge.*

ON THE PUSTULARY ACTION OF CROTON OIL.

BY DR. BARLAI.

The Tuscan Medical Gazette contains a paper by Dr. Barlai, supported by a great number of experiments, which reply to some apprehensions which several physicians had expressed relative to the purgative effect of frictions with croton oil. The following are the conclusions at which Dr. Barlai has arrived.

The pustules which croton oil causes are smaller and also extended over a greater surface than those which result from tartar emetic, but they are developed more

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promptly, and are much less painful. These pustules come more rapidly, are more raised, and more confluent on the part of the skin covered with hair than on the parts where it is bare. The pustules vary in size according to the different parts of the body; they are very small on the back, larger on the abdomen, larger still on the chest, fully developed and pemphigoïd on the thighs and calves of the legs. The frictions with croton oil on the lower part of the stomach, although they have occasioned pustules, have never caused any purgative effects. In order to obtain purgation by friction, it is necessary, says the author, to pour a few drops on the skin previously denuded by a vesicatory.

We may thus, without any fear of accidents, employ 4 grammes of croton oil in frictions, on the regions above mentioned, in order to excite the pustulary action.

NEW ODONTALGIC ELIXIR.

THE following is the formula for an elixir, published by Violand.

R. Tincture of pyrethrum	2	parts
Camphorated ether ..	2	,,
Sydenham's laudanum	1	,,

Mix. A few drops on cotton applied to the diseased tooth immediately remove the pain.—*Bulletin General de Thérapeutique.*

POISONING BY GOOSEBERRIES HAVING THE COMPLAINT CALLED THE WHITE.

THE white is the common name given to the grey or whitish patches which appear on the leaves and fruits of certain vegetables. This species of fungus appears particularly to affect the gooseberry, and when the fruit of this shrub is attacked by it, it acquires poisonous properties, the effects of which have just been observed by Dr. Perrochet, physician to the Hotel-Dieu, at Montmorency.

This practitioner, in the *Journal des Connaissances Médicales*, says that on the 20th July, a child of two years and a half old, of a good constitution, and who had never been ill, was suddenly attacked with violent colic, then with shiverings, heat, accompanied with anxiety, nausea, and convulsive movements, followed by prostration.

This child had, it was said, eaten gooseberries picked by himself in the garden. An oily purgative was administered, and caused a great quantity of undigested fruit to return; but the fever became more violent, the other symptoms worse. Dr. Perrochet having examined with a microscope the leaves and fruits which he suspected, he found that they were covered with fungi of the order lycoperdaceœ, which are known to be all poisonous.

The diagnostic being thus elucidated, Dr. Perrochet prescribed leeches, lettuce baths, and small lavements with starch, and four drops of laudanum. An antiseptic potion of ether and camphor, continual evaporation of ether on the forehead and cranium, sinapisms to the extremities, replaced by Pradier's cataplasms, camphorated oil of camomile on the abdomen, &c. This treatment was eminently successful. After 24 hours there only remained a little paleness and distension of the abdomen.—*Journal de Chimie Médicale*, Nov., 1851.

POISONING BY WHITE HELLEBORE.

BY DR. MAVEL.

THE medical journals publish numerous cases of poisoning by arsenic, mercury, copper, lead, champignons, opium, aconite, &c., but I have in vain sought for a case of poisoning by white hellebore. Its unfrequency induces me to publish the following fact; it is a proof that a very minute quantity of this poisonous substance may cause serious danger.

On the 5th of last November, I was called in great haste to a family of which six persons had suddenly fallen ill half an hour after dinner; the food had been the same as on the preceding days. Not possessing any data, I took a few medicines, and hastened to their assistance. On my arrival, I found the father and mother in bed, the son-in-law, two children of five and six years of age, and a tailor who had been working there all day, vomiting and suffering from severe cholic; the mother had taken soup only; she was in the greatest danger; the others had eaten bacon, potatoes, and cheese; they were less seriously ill. I thought that the soup had contained some poisonous matter, but it had not been found bad. No information was given to me at first on this subject.

The case of the mother having presented the most alarming symptoms, I shall describe it in giving the history of the poisoning.

Her age was 70; she commonly enjoyed good health. The following were the symptoms observed.—Her face was blueish and anxious, and her tongue cold, like the skin of a frog; general coldness of the skin, absence of pulse, eyes dull, blindness com-

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plete, vomitings of greenish matter, colic. If this woman alone had been ill, I should have thought it was an attack of cholera; but the coincidence of six persons being taken ill after the same meal convinced me that I had to treat a case of poisoning. I at once promoted the vomiting with emetic; at the same time I enveloped the patient in hot blankets, which were renewed every ten minutes, and I exerted friction on the thighs, whilst waiting for the sinapisms I had sent for.

Finally, after two hours of assiduous care, pulsation was restored, the heat of the skin began to return, and the vomitings became less frequent and more aqueous. The countenance resumed its expression; the blindness diminished; the colic became less intense. I carefully removed the sinapisms after they had been applied for an hour.

I saw the patient again in the evening; the reaction continued; on the succeeding days the patient was very well; but at the end of four days she showed me a sore which had been produced by the sinapisms. Was the production of this sore favored by the poisonous matter? I am inclined to think so, since the sinapisms do not produce this effect in so short a time.

When the woman was restored to sensibility, she informed me that she was the cause of the poisoning. Her son-in-law had an eruption of urticaria, which he took for the itch; he had been recommended to rub himself with a decoction of hellebore root; he therefore procured two roots of this plant, and his mother-in-law had boiled them in a saucepan; the product of this decoction had been emptied into another vessel, but the saucepan was not cleaned; this saucepan communicated to the soup its poisonous properties.—*Journal de Chimie Médicale*, October, 1851.

SYMPTOMS CAUSED BY SANTONINE.

BY M. SPENGLER.

A LITTLE boy, aged four years, suffered for some time from worms; santonine, in the dose of 10 centigrammes had several times been administered to him with success. One day he took double this dose twice. After the first dose, he felt ill, and suffered epigastric pressure, accompanied by colic and vomiting. He had several stools, in which were a great number of ascarides. Notwithstanding these evacuations, the symptoms continued, the body became cold, the face pallid, a blue circle appeared round the eyes, cold perspiration was manifested, the respiration became difficult and the extremities underwent convulsive movements. Dr. Spengler noticed, besides these symptoms, dilatation of the pupils and great pains in the stomach, which were not, however, increased by pressure. He ordered milk in abundance, and after further evacuations, a Riviere's draught in an oily emulsion. The little patient was put into a well warmed bed, and passed a disturbed night; next day, he took some calomel, after which several worms were evacuated. From that time, the child became convalescent. —*Repertoire de Pharmacie*, Oct., 1851.

FRICTIONS OF CHLOROFORM IN THE TREATMENT OF TETANUS.

THE success recently attending the treatment of tetanus by frictions with ether, particularly for relieving cramps and pains, necessarily gave the idea of using chloroform in the same way: this has just been done by Dr. Morrisseau, physician to the Hôpital de la Flèche. The patient was a man of the middle age, attacked with tetanus after a slight wound which had been made in the lower and anterior part of the leg with a pickaxe. Dr. Morisseau at once ordered this patient to be rubbed with 4 grammes of chloroform, three times a-day; in the evening he took a bath of acidulated vapor. Next day he had perspired abundantly, and had had some sleep, which had not been the case since the symptoms had shown themselves: a few teaspoonfuls of liquid had been swallowed, the muscles might be depressed, the convulsions were less frequent and not so long. The dose of chloroform was then raised, and was carried to 20 grammes at three times in the day; two baths of acidulated vapor were also administered. The perspiration continued; on the third day all the serious symptoms had disappeared, and at the end of five days of this treatment, there remained only a general numbness and great feebleness, which gave way to proper nourishment and moderate exercise.

ON GALVANO-PUNCTURE IN THE CURE OF VARICOSE VEINS, AND OF ANEURISMS.

BY PROFESSOR SCHUH.

THE experiments performed by the author have given the following results, which, on account of their interest, we shall detail at length. 1. The coagulation of the blood is not always the immediate consequence of

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electro-puncture employed during from ten to twenty minutes; on the contrary, it is frequently not observable until after the lapse of many hours, or until the second day, and it increases in degree during one or two days; it is, therefore, manifestly due to inflammation excited by the operation. Where the coagulation takes place during the operation, it is certaialy to be attributed to the chemical and also partly to the mechanical influence created by the presence of the foreign body. The more the mass of blood is kept at rest, the greater the probability that coagulation will set in during the operation; it is, therefore, advisable to apply a bandage above and below the seat of operation. The hardness shows itself most frequently earlier at the positive than at the negative pole; if the needles are, for example, three or four inches apart, the entire intervening space does not become hardened at the same time, but the central point between the two insertions remains more or less soft. 2. Sensibility to the galvano-puncture varies in different individuals; on closing the contact all experience pain, which, however, in one patient quickly ceases, or passes into a gentle prickling sensation; while in another it continues very violent, and even occasions spasms of the limbs. The pain occasionally abates, to return again in the same degree. It was most frequently more acute at the positive pole. 3. During the galvanic action, a greyish-white, lenticular, semi-transparent vesicle very soon forms around the needle of the zinc pole; a slightly bluish one subsequently appears at the negative pole; both are surrounded by a narrow red halo, in which the elimination of gas can be seen, and even crepitation can be perceived. 4. On the following day, a brown stain is observed on the burnt curticle in the situation of the vesicle, or more frequently a little scab, which falls off without suppuration in the course of two or three weeks, leaving a slight depression. On one occasion only did the formation of an eschar penetrate deeper. 5. The subsequent inflammation is indicated by the occurrence of pain. On the second day the hardness, heat, and sensibility have increased; the latter however, is seldom very excessive. These phenomena continue for a few days only; the coagulum of blood in contact with the inner coat diminishes, and draws the walls towards the centre, causing a diminution of the calibre of the vein. 6. A single application will scarcely ever effect a cure; the electro-puncture must be frequently repeated. 7. Its employment is not free from danger: phlebitis, with secondary pyæmia, is no uncommon consequence of the operation. Moreover it is evident that prudence in the choice of cases is indispensable, and that its performance is not admissible except when the trunks of the superficial veins of the lower extremity are alone dilated. In aneurisms in which the application of ligature to the vessel itself is no longer possible, or would be attended with too great danger, electro-puncture appears to offer a chance of success. only when preceded by the application of bandages to the periphery of the limb.—*Vierteljahrschrift für die praktische Heilkunde. Prag.* 1851. *Band.* 1, *Analekten, S.* 35.

A NEW METHOD OF PREPARING POWDERS FOR USE IN MEDICINE.

WITTKE of Erfurt recommends a new and very useful form of powder. Tinctures, as is well known, generally possess the most active properties of the drugs from which they are prepared, but the amount of spirit they contain often renders their employment unadvisable; Wittke, therefore, mixes tincture of hellebore, of cinchona, &c., with an equal quantity of sugar, evaporates to dryness, and powders the residuum. In this manner, he succeeds in concentrating, in a very small bulk, the active portion of a very large quantity of the drug, and he prescribes the powder as saccharised cinchona, &c. These preparations bear some analogy to conserves, over which, however, they have a great advantage in being free from mucilage, vegetable albumen, and other inert matters. —*Vierteljahrschrift für die praktische Heilkunde,* 1851. *Band.* 3 *Analekten, S.* 14.

ON POISONING BY DATURA STRAMONIUM.

BY M. CAZASECA.

A LETTER from M. Cazaseca, of Havana, to M. Dumas, contains the following observation, which confirms a remark relative to the effects of the datura stramonium already made by M. Runge, of Berlin.

Owing to the error of a pharmacien, a decoction of a plant which was suspected to be datura stramonium, was given to a lady instead of chicory (*chichorea intibus.*) Having been consulted relative to the decoction, M. Cazaseca, knowing that stramonium has no special reagent, gave to a dog 43 grammes of the decoction, and he observed all the symptoms of poisoning by stramonium; the animal did not die, but, at the

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end of fourteen hours, he was found perfectly restored. M. Cazaseca wished then to verify on a cat the effect announced by M. Runge, and this verification was made perfectly.

Having evaporated the decoction in a steam bath to the consistance of an extract he put a small quantity of this extract diluted with a little water, on the lower lid of the right eye of a young cat. Not seeing any change at first, he was for the moment inclined to think that M. Orfila was right when he said that this test is of no importance in toxicology. But, at the end of three hours, when he again examined the young cat, he saw that the pupil of the right eye was powerfully dilated, and that of the left eye contracted. The proportion of the axes of these pupils in the horizontal direction was as 6; 1; that of the right eye being three lines in length, and that of the left eye, half a line.—*Journal de Pharmacie et de Chimie*, October 1851.

PYROGENOUS OIL IN THE TREATMENT OF ECZEMA.

M. Lafond Gouzi proposes to replace, in diseases of the skin, the employment of various pyrogenous products: soot, pitch, petroleum oil, &c., by the pyrogenous oil resulting from the distillation of coal in the manufacture of lighting gas. The pyrogenous oil, employed locally, says M. Lafond Gouzi, is the most powerful modifier and the most energetic siccative of impetiginous eczema, especially in its chronic form, although it succeeds also in the inflammatory form; only, in the latter case, it requires more circumspection and caution, according to the degree of inflammation and susceptibility of the patient. The formula most frequently employed by M. Lafond Gouzi is:—

	Grammes.
Lard	30
Pyrogenous oil	8

This mixture, always allays the smarting, and in some cases the pains have been stopped as if by enchantment. In prurigo and psoriasis, he uses oil of hyoscyamus instead of the lard; sometimes, he employs the pyrogenous oil without admixture. He mentions, among other cases, that of a woman aged 45 years, attacked with suppurating eczema all over the fore-arm, and who had made use of the most highly recommended remedies without success; the surfaces were red and crusty; the smarting was insupportable; still three applications of pyrogenous oil made at five days' interval, restored to the skin its suppleness, and its normal state.

We must add, however, that M. Devergie, physician to the Hôpital Saint Louis, in a recent article in the *Bulletin de Therapeutique*, protests against the employment of pyrogenous oil which, according to him, can only be employed with much less advantage and much less security than the oil of pitch which never changes in its composition, whilst the pyrogenous oils are very variable. He says that there is often sold, in pharmaceutical establishments, a very thick oil of tar which, so far from curing, is very irritant, and with which, if a rather thick layer be applied, we stimulate, hide, and modify the disease, but do not cure it. It therefore seems to us necessary to appeal to new experiments before admitting the superiority of pyrogenous oil over oil of pitch, which is besides very cheap and cannot constitute a reason for preferring the oils resulting from the distillation of coal.—*Bulletin General de Therapeutique.*

PREPARATION OF A PURGATIVE SYRUP OF JALAP.

Pulverised jalap	80 grammes.
Alcohol at 10 degrees	300 ,,
Coarsely powdered sugar	300 ,,

Put the jalap and the alcohol in a flask, digest for 5 or 6 hours at a gentle heat, (90° to 100° F.) strain and filter, add the sugar; as soon as the latter is melted, strain, aromatise, and preserve for use. This syrup, which is of an agreeable taste, purges children very well, and is taken in the dose of one or two soup spoonfuls.—*Société Pharmaceutique d'Indre et Loire.*

MEANS OF PREPARING COLLODION EXTEMPORANEOUSLY.

BY M. VIEL.

The difference between this process and that in use, consists simply in steeping a second time well washed cotton in the mixture of sulphuric acid and nitrate of potassa, in order that if some parts have escaped in the first immersion, they may not do so the second time; and afterwards in throwing the well washed cotton into alcohol, drying and pressing between two cloths, and putting it immediately in contact with ether.

The collodion, thus prepared, possesses more powerful agglutinative properties than when we have recourse to the ordinary means.

In the ordinary preparation of collodion,

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a product is often obtained which is by no means adhesive; this is owing toa peculiar molecular state of pyroxyle. The remark of M. Viel has therefore much practical interest.—*Société Pharmaceutique d'Indre et Loire.*

ROOT OF THE BOX IN CHRONIC ARTHRITIS.

BY M. CAZIN.

M. CAZIN, in his *Traite' des Plantes Médicinales Indigènes*, notices the sudorific properties of box root, and relying on two facts which he relates, he recommends its employment in chronic arthritis succeeding acute articular rheumatism. The following is the formula he employs.

R. Root of box, rasped .. 30 grammes
Water ..... 1 kilogr.
Boil until it is reduced to half.
To be taken in three doses in the 24 hours.

PREPARATION OF SYRUP OF BALSAM OF TOLU.

BY M. CARRÉ.

Tincture of Tolu (Codex) 30 grammes.
Sugar ..... 1 kilog.

Pour the tincture on the sugar, stirring with a spatula; leave in contact for 12 hours; afterwards add 300 grammes of albuminous water, and boil. Filter without heat.—*Société Pharmaceutique d'Indre et Loire.*

PREPARATION OF SYRUP OF TAR.

BY M. CARRÉ.

INTRODUCE 125 grammes of liquid tar into a large bottle, and pour on 3 kilog. simple syrup at a temperature of 113° F., or else to place the whole in a sand-bath at the same temperature, for 5 or 6 hours. Agitate from time to time and filter cold—*Societe Pharmaceutique d'Indre et Loire.*

BOOK RECEIVED.

Elements of Electro-Biology, or the Voltaïc Mechanism of Man; of Electro-pathology, especially of the Nervous System: and on Electro-Therapeutics. By ALFRED SMEE, F. R. S. Longman and Co. 1849. pp. 158.

TO CORRESPONDENTS.

"A SUBSCRIBER." The following directions will enable you to make the calcutions you desire:

To reduce centigrade degrees to those of Fahrenheit: multiply by 9, divide by 5, and add 32.

Example: 100° C. × 9 ÷ 5 + 32 = 212° F.

To reduce Fahrenheit degrees to centigrade degrees: Subtract 32, multiply by 5, and divide by 9.

Example: 212° F. − 32 × 5 ÷ 9 = 100° C.

To reduce Reaumur's degrees to Fahrenheit's: Multiply by 9, divide by 4, and add 32.

Example: 80° R. × 9 ÷ 4 + 32 = 212° F.

To reduce Fahrenheit's degrees to Reaumur's: Subtract 32, multiply by 4, and divide by 9.

Example: 212° F. − 32 × 4 ÷ 9 = 80° R.

To reduce Reaumer's degrees to those of the centigrade thermometer: Multiply by 5, and divide by 4.

Example: 80° R. × 5 ÷ 4 = 100° C.

To reduce centigrade degrees to Reaumur's: Multiply by 4, and divide by 5.

Example: 100° C. × 4 ÷ 5 = 80 R.

"W. H." Both statements are correct. You must bear in mind the differences used in the proportions of the acid, and the difference in its strength in the two cases. We have not repeated Mr. Fownes' experiment.

"JUVENIS." The Metal *Vanadium* was discovered by Seftström, in 1830: the name is derived from Vanadis, a Scandinavian deity.

"M. P. S. G. B." The subject will be taken up in the number for January or February, 1852; most probably the latter.

As we have have heard of more than one instance in which books sent to us for review have not reached us, we shall feel much obliged if those who have sent us books, of which we have not acknowledged the receipt, will communicate with us on the subject.

NOTICE.—*All Communications, Books for Review and Substance for Notice must be addressed* "To the Editors of THE CHEMIST, care of Messrs. W. & T. Piper Paternoster Row, London." *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following No. will in future be received as late as the 20th.*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

ANALYSIS OF A CHALYBEATE WATER FROM THE NEIGHBORHOOD OF BRECON.

BY THORNTON J. HERAPATH, ESQ., ASSISTANT LECTURER ON PRACTICAL CHEMISTRY AT THE BRISTOL SCHOOL OF MEDICINE, &c., &c.

THE spring of water which forms the subject of the present examination is called by the country people "The Aber Well," in consequence of its being situated near Aber, a little unimportant village, in the parish of Llanvigan, lying about six miles to the south-east of Brecon.

The following information respecting it has been kindly communicated to me by the Rev. T. J. Powell, of Cantreff. The proprietor of the farm (called Llwynbedr), where the spring was originally found, is Mr. John Edwards, who, fearing that his land would be injured by persons visiting the well, erected a wall by the road-side, in order to prevent their approach. Whilst digging out the foundations of the wall, however, the spring was so much disturbed, that its course was changed, and it now rises outside the wall, in a small piece of waste ground adjoining the high-way, and publicly offers its services to travellers.

The spring is small and weak, but it is evidently highly charged with iron, as is shown by the reddish, ochreous appearance of the powder it deposits on the surface of the stones over which it flows. It issues from the lower part of the old red sandstone rock, which is somewhat depressed at the spot.

The surface-soil is marshy, and thickly covered with bushes.

Mr. Powell determined the temperature of the water, and compared it with that of a mountain rivulet running about 100 yards distant; both indicated the same degree, namely, 44° F.

As regards the medicinal qualities of the waters, they are held in great estimation by the country people of the neighborhood, who assert that they have effected many miraculous cures. It is evident, however, that their importance has been greatly over-rated, and that, in many cases, the restoration of the patient to health and strength is to be attributed as much to the change of air as to the tonic virtues of the spring. Still, there is no doubt, that the water acts beneficially on the system of persons who are suffering from debility, and consequently the well is much resorted to by those residing in the dense and unhealthy atmosphere of the iron-works, and also by many from the surrounding districts.

It is said that the late Col. Gwynne Holford, of Buckland—the then Lord of the Manor—had the water analysed a few years since; but as the results were never published, I am sorry to say, I have not been able to compare them with my own.

A qualitative analysis pointed out the presence of the following substances —

Sulphuric, carbonic and hydrochloric acids; lime, magnesia, soda, and oxide of iron; together with small quantities of silicic and nitric acids, crenic and apocrenic acids, potassa, oxide of manganese (?), alumina (?), and nitrogenous organic matter. Not the slightest trace of iodine or bromine could be detected.

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The specific gravity of the water was not determined.

QUANTITATIVE ANALYSIS.

A.—Determination of the total amount of saline constituents.

Water employed.	Weight of fixed residue.	Per Pint.
I. 8750 water grain-measures.	3·001 grs.	= 3·001
II. 4375 ,,	1·498	= 2·996
	Mean.	2·9985

B.—Examination of the precipitate produced on boiling.

Two imperial pints = 17,500 water grain-measures of the water were boiled for two or three hours in an open porcelain vessel, until no more carbonic acid gas was evolved, and the liquid was reduced to about one-sixth of its former bulk. The fawn-colored and somewhat crystalline precipitate that was formed, having been carefully collected, &c., was dried on a sand-bath and weighed. The small quantity of carbonate of lime which remained adherent to the sides and bottom of the dish was dissolved off by a few drops of dilute hydrochloric acid and re-collected by precipitation by carbonate of soda, &c., in the usual manner; it amounted to 0·012 gr. = 0·006 per pint.

The precipitate (*a*), when subjected to analysis, gave the following numbers:—

	Gr.		Per Pint
Carbonic acid....	0·024	=	0·012000
Carbonate of lime.	0·021	= Lime	0·007840
Pyrophosphate of magnesia	0·038	= Magnesia.	0·06662

It also contained some oxide of iron and a little silicic acid, with traces of sulphuric acid, &c.

C.—The filtrate from B was intimately mixed with the washings of the filter, and carefully divided, by means of a graduated tube, into two equal portions. One of these was employed for the estimation of the sulphuric acid, chlorine, lime, and magnesia; the other for that of the alkalies, potassa and soda.

The first portion gave:—				Per Pint.
Sulphate of baryta.....	2·673 grs.	=	Sulphuric acid.....	0·906125
Chloride of silver.....	1·625	=	Chlorine.....	0·406210
Carbonate of lime.....	0·701	=	Lime.....	0.392560
Pyrophosphate of magnesia	0·488	=	Magnesia.....	0·174285

The second portion gave:—

Mixed alkaline chlorides.. 0·902 grs.

Potassio-chloride of platinum 0·013 gr. = chloride of potassium 0·004 gr. = potassa 0·002507 gr. per pint; there was, therefore, of

Chloride of sodium 0·898 gr. = soda 0·47893 gr. per pint.

D.—Estimation of the oxide of iron.

	Water employed.	Fe^2O^3 obtained.	FeO per pint.
I.	17500 water grain-measures....	0·737 gr.....	0·33165
II.	8750 ,, ,, ...	0·369	0·33210
		Mean.....	0·331875

E.—Estimation of the silicic acid.

Water employed.	SiO^3 obtained.		Per Pint.
17,500 water grain-measures....	0·423 gr.	=	0·21150

F.—Estimation of the nitric acid.

Water employed.	Ag Cl obtained.		NO^5 per pint.
35,000 water grain-measures.....	0·042 gr.	=	0·00395

G.—Estimation of the organic matter.

Water employed.	Organic matter.		Per Pint.
35,000 water grain-measures.....	0·165 gr.	=	0·04125 gr.

H.—Estimation of the organic acids.

Water employed.	Apocrenate of copper obtained.		Apocrenic acid*		Per Pint.
70,000 water grain-measures.	0·046 gr.	=	0.02284 gr.	=	0·002855 gr.
	Crenate of copper obtained.		Crenic acid.*		
	0·017 gr.	=	0·0109 gr.	=	0·001362 gr.

* Estimated indirectly by decomposing the copper salts by heat, redissolving the oxide of copper left in weak nitric acid, and determining the proportion of metallic copper contained in the solution by means of a colorimeter, by Jacquelain's process (*Comptes Rendus*, 8 *Juin*, 1846.

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If we deduct, therefore, from the weight of the organic matter, as before estimated, (see G,) that of the organic acids, we shall of course obtain the true weight of the extractive or nitrogenous organic matter contained in the water :—

0·041250—0·004217 = 0.037033 per pint.

The results of this analysis are given below, in a tabularform :—

			Per Pint.
Carbonic acid combined with lime and magnesia (see B)	0·014640		
Ditto combined with protoxide of iron (calculated)	0·202675		0·217315
Sulphuric acid (see C)			0·9061250
Silicic acid (see E)			0.211500
Nitric acid (see F)			0·003950
Chlorine (see C)			0·406210
Soda (see C)			0·478930
Potassa (see C)			0·002507
Lime in precip. that is formed on boiling (see B)	0·011200		
Ditto in filtrate (see C)	0·392560		0·403760
Magnesia in precip. that is formed on boiling (see B)	0.006662		
Ditto in filtrate (see C)	0·174285		0·180947
Protoxide of iron (see D)			0.331650
Oxide of manganese			Doubtful traces.
Alumina			Ditto.
Organic extractive matter (see G)			0·037033
Apocrenic acid (see H)			0·002855
Crenic acid			0·001362

From the qualitative examination of this mineral water I am induced to believe that these substances are combined in the following manner :—

	Per Pint.		Per Gallon.
Chloride of magnesium	0·418383	=	3·3471
Chloride sodium	0·154076	=	1·2326
Sulphate of potassa	0·004640	=	0·0371
Sulphate of soda	0·709669	=	5·6774
Sulphate of lime	0·957212	=	7·6577
Nitrate of lime	0·006000	=	0·0480
Carbonate of lime	0·020000	=	0·1600
Carbonate of magnesia	0·014000	=	0·1120
Carbonate of the protoxide of iron	0·534325	=	4·2746
Oxide of manganese	Doubtful traces.		
Alumina.	Ditto.		
Organic extractive matter	0·037033	=	0·2962
Apocrenic acid	0·002855	=	0·0228
Crenic acid	0·001362	=	0·0109
Lime, in combination with organic acids?	0·001514	=	0·0121
Silicic acid	0·211500	=	1·6920
	30·72569		24·5805
Fixed residue found by direct experiment.	2·998500	=	23·9880

Mansion House, Old Park, Bristol,
November 20, 1851.

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ON THE RESINS OF ARBOL-A-BREA AND ELEMI.

BY M. SAMUEL BAUP.

THE resin which forms the principal subject of this article, and which has hitherto been designated under the name of arbol-a-brea, comes from the Philippine islands, whence it was brought to Europe, in 1820, by M. Perrottet, a practical botanist, then travelling for the *Jardin des Pluntes*, Paris.

This resin, which is so common in Manilla as to be employed there for caulking boats, has already been made the subject of some chemical investigations, by MM. Maujean and Bonastre. The first found it to be composed of two resins, one soluble in cold alcohol, and the other in hot alcohol only; M. Bonastre found in it:—

A soluble residue.....	61·3
Crystallised sub-resin.....	25·0
Superabundant acid.....	0·5
Volatile oil with a citron odor..	6·3
Bitter extract.....	0·5
Woody and earthy impurities...	6·4
	100·0

Having been directed by the *Société Vaudoise des Sciences Naturelles*, to examine a sample of this resin which had been presented by one of its members, M. Perrottet himself, I applied myself to researches which I was compelled to suspend from want of matter. I intended to resume this work when I could procure more resin; but not having succeeded in doing so at present, I think it right to give these researches, incomplete as they are, in order that they may not be lost, and also in the hope of attracting the attention of some chemist better able than myself to procure from the East Indies this resin, which is at present unknown in the drug trade.

I have endeavored to discover the botanical name of the tree which produces it and which bears, in the Philippines the popular name of *arbol-a-brea*, (pitch tree). According to M. Maujean, M. Perrottet introduced this tree into several French colonies, and also sent several young plants to the hot-houses of the *Jardin-des-Plantes* at Paris, where Virey says he has seen them. It was hoped, on their flowering, to arrive at their botanical character; but I have ascertained that their existence is quite unknown at those places.

Having found in the Delessert Museum a Flora of the Philippine islands, published by Padre Blanco, in Spanish,* I think I have discovered the vegetable which furnishes the resin in question, and which appears to me to be a species of the genus *canarium* L. *(pimela Laureiro)* of the dicœcia pentandria of Linnæus; of the family of the terebinthaceœ, very near the genus amyris. The species to which I have thought I might refer it is the *canarium album* Roeush (De Candolle Prodr. t II, p. 80). In the Flora of the Philippines (p. 791), it is described as a large dioïc tree, with pennate leaves, with four or five pairs of uneven folioles, oblong, pointed, entire, smooth, &c., whose resin serves the Indians, in Manilla, for caulking their boats, for lighting, and for various medicinal purposes.

The resin with which I made my experiments had a slight resemblance to resin of elemi; it was not homogeneous, but consisted of more or less pure, translucid, greyish or yellowish layers, having a flinty fracture, softening a little in the fingers and sticking to them. Other parts were blackish and smoked, which is explained by the custom followed in Manilla, of accelerating the flowing of the juice, by lighting a fire round the trees in which incisions are made, an operation which does not appear to injure them much. The odor of this resin resembles that of fennel, citron and turpentine.

EXTRACTION OF THE PRINCIPAL MATTERS CONTAINED IN THE RESIN.

§. 1. Submitted to distillation in a glass retort with water, the resin melts at once; in proportion as the essential oil distils over, it acquires a more pasty consistence, so that it is impossible thus to extract the whole of the oil. From 40 grammes of resin, I have extracted 3 grammes of a colorless oil, lighter than water and of a very agreeable odor, which makes 7½ per cent., a quantity little inferior to that which the resin should contain.

§ 2. Treated cold by alcohol at 85 per cent., it left a bulky residue which was white or greyish according as the parts of the resin were more or less pure.

To extract what has been called the sub-resin fom the residue insoluble in cold alcohol, it is advantageous to use very strong alcohol, of 90 to 95 per cent.; it is boiled and the solution is filtered as hot as possible, in a closed funnel. After cooling, the greater part is deposited; it is strained with pressure through a fine cloth.

* Flora de las Filipinas, por el Padre Blanco; Manilla, 1837.

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When all the soluble portion of the residue has been thus dissolved, there remains only woody and earthy debris.

§ 3. To obtain this sub-resin in the pure state, it should be moistened several times with alcohol at 85 per cent., and pressed in blotting paper; finally, it must be redissolved in boiling alcohol from which it crystallises by cooling in white and very fine filaments, forming with the liquid a kind of magma which is thrown on a filter, in a covered funnel, in order to allow the liquid to flow out; the sub-resin is washed again and should be dried in the air; it may then be regarded as very pure.

Having ascertained that it was the same substance as the sub-resin of elemi, I shall employ only the name *amyrine* for designating both; as well that of the *amyris elemifera* as that of the *canarium album*, or arbol-a-brea.

§ 4. The alcoholic solutions of § 2, containing the resin soluble in cold alcohol, the essential oil and several other substances were distilled in a retort at a gentle heat; they furnished an alcoholic liquor which became turbid by the addition of water, and contained the most volatile and the sweetest part of the essential oil. This liquor, whose odor appeared to me to combine that of the orange peel and mace, will, perhaps, be appreciated by perfumers and makers of liqueurs. By continuing the distillation, the liquor, becoming weaker in alcohol, becomes turbid and loses much of its sweetness.

§ 5. After having poured into a capsule the residue of the distillation, water was added and the evaporation continued, at a gentle heat, until the greater part of the alcohol was driven off; after cooling, the liquid floated on a semifluid resinous mass.

§ 6. This soft resin was treated several times with alcohol at 50 per cent., with the aid of heat, and each time, after cooling, the liquor was decanted and added to that of § 5, provisionally set aside, in order to extract other products from it.

§ 7. The above soft resin, after having been treated several times by alcohol at 50 per cent., constitutes, if it be dried in this state, the soluble resin of MM. Maujean and Bonastre. It also retains, among other things, amyrine and another crystallisable matter.

§ 8. To extract the latter, the above soft resin is dissolved in alcohol at 85 per cent.; this solution is left exposed to the air, covered with a simple paper, in order to allow only a very slow evaporation of the alcohol, until a white crystalline deposit is produced (if a portion of the deposit is fluid and terebenthinous, the addition of a little alcohol is necessary for redissolving the fluid part only). In the crystalline deposit is found, besides a little amyrine, the peculiar crystalline substance which it is desired to extract from it, by successive solutions and crystallisations, until it is obtained pure, crystallised in small brilliant, trasparent prisms, very different from amyrine, as will be seen further on, by the explanation of some of their properties. It was this substance which I announced, a long time ago, under the name of breïne, a name which I retain, although it has since been incorrectly applied to the sub-resin.

Breïne is contained only in very small quantity in the resin of the *arbol-a-brea*; at least I have only been able to extract about one-hundredth of it; whilst amyrine forms about one-fourth of the total weight of the resin. I do not doubt that the means of extracting more will be found, when the mode of extracting the different bodies of which this resin is composed has been varied more than I have been able to do.

§ 9. The alcoholic solution of the resin soluble without heat from which the breïne § 8 has been extracted, should be mixed with a certain quantity of water, in a capsule, and heated to drive off the alcohol with a little essential oil, then dried at a moderate heat. It is then presented as a transparent resin, of a more or less amber tint, brittle, without odor, and without the slightest disposition to crystallise. In this state, although it is not yet pure, since it retains, at least also breïne, it is, however, purer than the soluble resin above spoken of, § 7. I shall here designate it by the name of amorphous resin.

§ 10. The liquors and residues of § 5, 6, and 9 were heated to drive off the alcohol and the essential oil which they still contained. During the evaporation, the liquor in proportion as it became concentrated, took a sherry tint, and developed drops of an oily liquid, which lost their fluidity in cooling, and assumed the appearance of a resinoïd matter, or soft wax, which was surrounded or covered with a crystallisation in white filaments; these were collected and dried in the air, to be afterwards purified. The evaporation of the water was afterwards continued in order to extract a further quantity. Finally, all the mother liquors were carefully collected and preserved in order to extract the peculiar substance of which I shall shortly speak.

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The resinoïd matter which was separated during the evaporation and cooling of the above aqueous liquors, was boiled with water in a phial; it melted at once and exhaled an odor of peppermint or cardamoms, which finally became like that of turpentine. After cooling, it was deposited as a white, filamentous matter; the decoction was continued until the resinoid matter ceased to furnish any.

§ 11. To purify this white filamentous matter, obtained by the cooling of the aqueous liquors of § 10, it was redissolved and the solution filtered while almost boiling; these solutions and crystallisations were repeated until it became of a perfect whiteness, and did not leave the least residue, when exposed to heat.

The property which this substance possesses of subliming in very fine white needles, arranged in branched fasciculi, so as to resemble a vegetation of moss, induced me to designate it by the name of bryoïdine.

§ 12. All the mother liquors or the aqueous residues were united and evaporated at a gentle heat, to a syrupy consistence. Two layers were formed: the lower one, consisting principally of inorganic salts in which the chloride of potassium predominated, and the upper and more considerable part, which was brownish, had an oleaginous appearance and a bituminous odor. The latter having been separated from the other, was mixed with water and heated, then filtered and evaporated almost to a syrupy consistence. After some time brownish crystalline crusts were formed, which were washed with a little weak alcohol. The new mother liquors, heated with a little water, and subjected to spontaneous evaporation, gave also a little crystalline crust.

These deposits, redissolved in water and purified by repeated crystallisations, ultimately produced transparent, colorless, crystals.

I shall give, further on, some characters which I have recognised in this substance, so far as I have been enabled by the small quantity of it which I obtained, and to avoid circumlocution, I shall call it *breïdine*.

I have not attempted to determine the nature of the acid found at the end of the various treatments of the crude resin, on account of the smallness of its quantity; and, also, because it appeared to me probable that it might be due to the various impurities which accompany the resin, and, perhaps, also, to the action of the air on the mother liquors. Be this as it may, neither an alcoholic solution of the purest pieces of the resin, nor any of the bodies which I extracted from it, showed any acid reaction.

From the foregoing it results that the resin of *arbol-a-brea* contains the following matters:—

1. Essential oil.
2. Amyrine.
3. Amorphous resin.
4. *Breine.*
5. *Breoïdine.*
6. *Breïdine.*
7. Various saline and extractive matters, with ligneous and earthy impurities.

I shall now point out the principal properties which I have recognised in amyrine and the three new substances contained in the resin of *arbol-a-brea*.

AMYRINE.

The sub-resin of the arbol-a-brea, which was made known by MM. Maujean and Bonastre, was described by them as a white substance, insoluble in cold, but soluble in hot alcohol. M. Bonastre has particularly described it as being of extreme whiteness, brilliant, and in very distinct crystals, without any consistence, thin form, radiated, globular, and divergent; he adds that they contain a large quantity of interposed alcohol, which sometimes amounts to 96 parts to 16 of crystals, and is then presented as a jelly; finally, when dried they are rough and dry to the touch; he also remarked that it was very phosphorescent when dry or even under water.

M. Dumas, who analysed it, found it to be composed of—

Carbon	85·3
Hydrogen	11·7
Oxygen	3·0
	100·0

By calculation we find—

40 equivalents of carbon .	240	85·41
33 ,, hydrogen .	33	11·74
1 ,, oxygen .	8	2·85
	281	100·00

These are exactly the numbers obtained by M. Hess* in his analysis of the sub-resin of elemi. Thus the parity of composition and of the properties of these two sub-resins warrants us in considering them as one and the same substance for which it is convenient to preserve the name of *amyrine*.

To the foregoing characters, I add the

* *Poggendorff's Annalen*, t. XLVI, p. 322.

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following:—It is very soluble in ether, from which it crystallises in satiny fibres of considerable brilliancy. Absolute alcohol dissolves it largely with the aid of heat; a large portion is deposited by cooling in intertwined filaments; a little water added to the solution renders it almost solid, by precipitating the amyrine, which retains the water imprisoned in its crystalline filaments. Water has absolutely no action on it. Essence of turpentine and oil of sweet almonds dissolve it in greater quantity with the aid of heat than cold.

It melts at 345° F., into a colorless liquid, which remains transparent after cooling.

Nitric acid exerts no action on it without heat; when heated, the amyrine enters into pasty fusion, turns yellow, swells up very much, emitting red vapors, and is finally dissolved. If it be then allowed to cool, a yellow, acid resinous matter is deposited, which has not been further examined.

BREÏNE.

Crystallised slowly from an alcoholic solution, it occurs in transparent, rhomboidal prisms, of about 70° and 110°, terminated on each side by a feather-edge, whose angle at the summit is about 80°. By prompt cooling, the crystals become needle-shaped.

Breïne is completely insoluble in water. It dissolves in 70 parts of alcohol at 85 per cent., at the temperature of 68°F.; it is more soluble in hot alcohol; it is very soluble in ether.

It fuses at 368°F. into a transparent and colorless liquid. Finally, it acts like a neutral resinous matter.

BRYOÏDINE.

Bryoïdine crystallises in water in white, silky filaments. Its taste is slightly bitter and acrid, or rather burning. When heated, its vapor gives out a peculiar odor, which produces a sudden astriction and dryness of the throat, and causes coughing.

It fuses at the temperature of 275° F., into a colorless liquid which, by cooling, is suddenly concreted into a fibrous, pappy mass.

Bryoïdine begins to volatilise long before melting; when it is perfectly pure, it volatilises without leaving traces. Sublimed in fine, white, woolly, ramified needles, it resembles a delicate mossy vegetation; whence its name, as I have stated above. It is sufficient to place a few milligrammes in a watch-glass covered with a second, inverted, and to heat slightly, to produce, immediately, this characteristic sublimate, which is one of the most beautiful substances of organic chemistry.

It is sparingly soluble in cold water; at 50° F., it dissolves in 350 parts; with heat, it is much more soluble, for a boiling saturated solution, becomes almost a mass by cooling. As fused bryoïdine dissolves very slowly, it should be powdered before making aqueous solutions. It is very soluble in alcohol and in ether; it is also soluble in oil of turpentine and in the fat oils.

The aqueous solution of bryoïdine has no action on litmus paper. Acetate of copper, the chlorides of iron aud mercury, nitrate of silver and tincture of galls produce in it no turbidness, as do the neutral, and, still more, the basic acetate of lead.

Bryoïdine appeared to me to crystallise without alteration, in water containing carbonate of soda, and carbonate of ammonia, and also in very dilute acetic acid. It dissolves in great abundance in concentrated acetic acid; the addition of water occasions a precipitate. Concentrated sulphuric acid dissolves it instantaneously, producing a red color; the solution turns brown on being heated. A little nitric acid, added to the aqueous solution of bryoïdine, renders it turbid, after a short time it becomes clear, depositing yellowish drops. Nitric acid, poured on bryoïdine, dissolves it, giving rise to a yellowish oleaginous liquid, floating on the acid, and dissolving in it with heat.

BREIDINE.

This substance crystallises in transparent rhomboïdal prisms, terminated by a flattened pyramid, with four facettes. The indication of the sides of the prism, between them, is about 102 and 78°. I have also observed crystals having the acute angles of the prism and of the pyramid replaced by a facette. The crystals which are obtained by the cooling of a solution are acicular prisms.

Breïdine dissolves in 260 parts of water at 50°F.; in hot water it is much more soluble. Alcohol readily dissolves it; it is sparingly soluble in ether.

Exposed to a gentle heat, the crystals of breïdine became opaque. They fuse at a temperature a little above that of boiling water. They sublime entirely and without decomposition; the vapor is rather pungent and causes coughing.

The aqueous solution of breïdine acts in the same manner as that of bryoïdine with the reagents tried; only tribasic acetate of lead produced a white precipitate with the former.

I regret that the small quantity of these

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three new substances which I was able to extract from the resin sent to me did not permit me to devote more to the examination of their reactions and especially to their analysis. The study of these new bodies will show, I doubt not, notwithstanding their difference of solubility, appearance, &c., resemblances in composition, from the least soluble amyrine, to the most soluble breïdine (amyrine appears to me to be to breïne what bryoïdine is to breïdine); their mode of acting with heat betrays, by various indications, degrees of kindred which it will be interesting to determine.

RESIN OF ELEMI.

Being desirous of ascertaining whether the resin of elemi did not also contain substances analogous to those found in the resin of the *arbol-a-brea*, which it in some respects resembles, I at the same time treated several ounces of commercial resin of elemi of fine quality, in nearly the same manner as the other; but I found in it, besides the sub-resin and soluble, amorphous sub-resin, only a peculiar substance, analogous to breïne, but still quite distinct from it, which is rendered evident by some of its properties; the small quantity which I had obtained of it did not admit of my multiplying the reactions; it is the body which I had announced* under the name of elemine, which name may be retained for it.

ELEMINE.

This substance crystallises in thin, transparent, colorless,† and very brilliant hexahedral prisms, terminating in points; I detected in some crystals very acute or excessively lengthened rhombohedra.

It fuses at about 392° F. It dissolves in 20 parts of alcohol at 88 per cent. at the ordinary temperature; it is more soluble in it hot than cold; a portion crystallises by cooling. Absolute alcohol dissolves it in larger proportion; it is also soluble in ethers. Water has no action on it, and like breïne, it appears to be a neutral resinous body.—*Journal de Pharmacie*, Nov. 1851.

NOTE ON A MURAL PAINTING OF THE THIRTEENTH CENTURY, FOUND IN THE SAINTE-CHAPELLE.

BY MM. DUMAS AND PERSOZ.

THE works of restoration so successfully performed under the skilful direction of MM. Duban and Lassus, have restored to the Sainte-Chapelle the beauty which made this edifice one of the wonders of the period of the crusades. The careful researches to which their execution has given rise, have led to the discovery of an Annunciation painted on the bare wall, in a false window, on the north side of the lower chapel. This painting of the thirteenth century is in the most perfect preservation; it was evidently conceived in imitation of a painted window, the style and arrangements of which are copied in it. Being covered with plaster, it was easily restored by careful cleaning.

The Minister of public works having instructed us to examine this painting, and to communicate to him the nature of the colors used in its execution, as well as that of the excipients which had served for fixing them, we have endeavored to fulfil this mission, which the natural desire of sparing the picture rendered so delicate that we were obliged to devote much time and care to it.

The window is divided into three compartments. The figure of the Angel Gabriel, which occupies the compartment on the left of the spectator, required for its execution, as will be seen from the drawing which we exhibit to the Academy, the employment of all the colors whose nature we had to ascertain, as well as of all the processes which appear to have been put in practice for the different portions of the work.

A fat and resinous *stucco*, analogous to that which MM. Thenard and D'Arcet have devised, to place hot and bare on the cupola of the Pantheon, had been similarly applied on the stone which bears the picture in the Sainte-Chapelle. It is even probable, from the appearance of the stucco of the thirteenth century, and from the condition of its penetration into the stone, that it was composed and applied in an analogous manner to that which has succeeded so well in the hands of MM. Thenard and D'Arcet.

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* *Annales de Chimie et de Physique*, 2nd Série, t. XXXI. p. 109.

† These crystals, which were colorless for some time after their formation, became yellowish at the end of several years, although contained in a tube. An analogous coloration, but more prompt and more powerful, took place with very pure and previously quite colorless *abietic acid* which was extracted from the resin of *pinus abies (abies excelsa* of Candolle,) and also with colorless *pnïc* acid, extracted from a colophane of France, supposed to result from the *pinus maritima*. V. *Annales de Chimie et de Physique, loc. cit.*, in which a typographical error makes me to say, that these resinous acids combine with the *acids*. It should have been *oxides*.

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The penetration of the stucco of the cupola of the Pantheon, is, however, deeper. We may, therefore, hope that, so far as the preparation of the bottom is concerned, the resources of modern chemistry will have secured for the paintings with which that edifice is decorated, at least equal chances of duration to those with which the painting of the Sainte-Chapel has been endowed for the last 500 years.

On this resinous stucco, the painter of the Sainte-Chapelle had fixed gold leaf, which formed the under part of almost the whole of the painting.

But these gold leaves are not applied immediately on the resinous stucco. As a medium, and perhaps with the view of heightening or sustaining the color of the gold, an orange red cement was made use of, formed probably of emplastrum diapalmæ, malaxated in the soft state with minium. Some portions of this cement which were thick enough to admit of examination, presented all the properties of such a mixture.

When powdered, it gave out a rancid odor, exactly resembling that of emplastrum diapalmæ. On being heated, it turned black; treated by hydrochloric acid and alcohol, chloride of lead was obtained, and a mixture of fatty acids which presented the properties of a mixture of oleïc and margaric acids.

100 parts of this cement contain :—

Protoxide of lead . .	81
Fatty acids	19
	100

We have not estimated the minimum separately; it is evident that its proportion is variable.

The white of the extremity of the wings of the Angel, and of some other parts of the picture, had lead for its base. The color dissolved in acetic acid, which laid bare the gold leaf, and the liquor presented all the reactions of the salts of lead. It is probable, therefore, that the whites were obtained with a preparation of lead analogous to, or even identical with, white lead.

The blues were evidently obtained with two different colors.

One of these blues, employed in the draperies, turned green when exposed to the action of a red heat. The calcined product was soluble in nitric and hydrochloric acids. The evaporated solution left a white residue which, by digestion with hydro-sulphate of ammonia, was converted into insoluble protosulphuret of iron and soluble phosphate of ammonia. This same residue was immediately converted into Prussian blue by simple contact with a solution of ferrocyanide of potassium.

The blues of the draperies were therefore obtained with phosphate of iron, and probably with the native phosphate of iron.

The other blue parts of the painting presented a quite different aspect. Treated by crystallisable acetic acid which removed from it an abundant resinous matter, the blue substance which was detached, was deposited in plates or lamellæ of the purest tone, mixed with remains of the gold leaf.

These blue lamellæ heated to intense redness, left a white residue.

The concentrated alkalis had no action on this blue matter, which disappeared, on the contrary, in hydrochloric acid with a disengagement of sulphuretted hydrogen.

This second blue was therefore obtained by means of ultramarine.

The bright red, by means of which the halo surrounding the head of the Angel is painted, consists of vermillion. Indeed, distilled with lime, it furnished metallic mercury. Under the painting, it was easy to recognise the presence of the leaves of gold, which were found almost everywhere, but which, in this particular case, seem to contribute to giving still more brilliancy to the vermillion tint.

All the browns and yellows were painted with ochres.

The greens result from the admixture of these same ochres with the phosphate of iron.

The rose and violet colors presented characters worthy of attention. At first sight, we thought we had madder lakes, but we could extract neither alizarine nor any other rose or red coloring matter presenting any analogy to the coloring matters of this kind hitherto isolated by chemists.

The alkalis have little effect on these colors; even the weakest acids attack them. The solution thus obtained contained lime with traces of phosphate of lime. These colors had therefore, for an excipient, carbonate of lime mixed with a small quantity of phosphate of lime.

Observed with the microscope, the rose matter, freed from resinous stucco, presented fragmentary lamellæ which had the appearance of neither a precipitate nor of any crystalline or amorphous mineral matter.

On the contrary, on comparing the rose colored matter of the painting with the dust obtained by powdering the rose colored shells most common on the banks of the English Channel, we found in the latter all the appearances which we had noticed in the examination of the color of the Sainte-Chapelle.

The rose powder prepared by means of

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the shells presents, besides, the same tone. It acts the same with the alkalis; it is likewise dissolved in the acids; it gives up to them lime with a little phosphate of lime.

According to all appearance, the rose powder employed in the thirteenth century, was obtained by pulverising the rose shells of the Tellina fragilis, which are found on our shores in great abundance.

We were naturally led to suppose that the violet color, possessing the same properties as the rose color, had been obtained by the same means. However, viewed through the microscope, the latter appeared to be in small curved masses, and not in flat angular fragments, with irregular or right edges, like the rose powder.

The violet matter being very little alterable by the alkalis and furnishing with the acids which dissolve it, lime accompanied by traces of phosphate of lime, it was, however, very probable that its origin was the same.

Now there exist an abundance of shells which, indeed, are not uniformly of a violet color, but whose external surface is covered with violet stains. The shells of the *Neretina fluviatilis* are of this kind. The matter of the violet stains of these shells being separated and subjected to the action of the alkalis and acids acted with them like the violet coloring matter of the picture. Examined with the microscope, they presented the same appearances.

We consider it probable, consequently, that the rose and violet matters of the picture of the Sainte-Chapelle, were obtained from shells, by means of a simple mechanical preparation.

Their preservation will attract attention; more especially since attempts have recently been made, and not without success, to prepare with the remains of sea-shells, whites which, with regard to brilliancy and pearly lustre, had a real value, and which, in their resistance to the action of sulphuretted gases, left nothing to be desired.

This part of our work being terminated, it remains to give an account of the means employed in the application of the colors which we have just defined.

In examining the picture in this point of view, it seemed to us that they had not been ground in oil and laid on with a brush or pencil as is now the practice.

If we were to form a conjecture as to the process followed by the painter of the thirteenth century, we should be disposed to presume that after the application of the gold, he covered the place to be painted with a mordant of drying oil, and that this oil, being brought to a suitable consistence, was sprinkled with the color in dry powder, by a process analogous to that which is used for making velvet papers.

The pulverulent colors were fixed on places in a similar manner in the manufacture of painted glass, in that of certain kinds of pottery, whether the color were projected in powder on the place covered with varnish, or deposited on it dry with a badger.

This process is the only one that appears to us adapted for explaining how the colors of the picture of the Sainte-Chapelle could have been applied, having been deposited in very thin but not *pasty* layers, and were fresh and pure tones are not soiled by the brown tint of the fatty stucco which penetrated the stone, or which was deposited on the gold leaf.

Moreover, the whole picture had received a final preparation. A stucco of wax, which covers the whole of the painting, and whose effect is still very happy, gives to the colors a slightly brilliant appearance at the same time that it must have contributed to preserve them from the action of humidity.

We must not forget, however, that if the nature of the colors has been established by analyses which admit of no doubt, it is by no means the same with the mode of their application; we therefore suggest them here only with reserve and as proper views for directing artists in the endeavors which they may make, when called upon to execute decorative painting, with relation to the numerous restorations of which the mediœval monuments are now the subject.

M. DUMAS gave some information on the means employed in the thirteenth century for sealing iron in stone, in the low and damp parts of the building of the Sainte-Chapelle. The iron was perfectly preserved; but it was sealed with protoxide of lead. This appears to have been used hot, for in flowing into the holes prepared for ordinary sealing, MM. Dumas and Persoz ascertained that it contracts with the iron a perfect adhesion, and that if it is separated from the stone by retreating, the vacuum will soon be filled up and the union established by means of the formation of carbonate or hydrate of lead caused by the contact of humid air. Now, if the sealing of the Sainte-Chapelle consists, for the most part, of pure protoxide of lead, it is observed that on the surface, in the part which was in contact with the stone, it is covered with a crust of carbonate and hydrate of lead. From the physical characters of the protoxide of lead of this ancient sealing, we should, however, be led to believe that it was done cold.—*Comptes Rendus*, No. 19, Nov. 10, 1851.

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CHEMICAL AND PHYSIOLOGICAL STUDIES CONCERNING SILK-WORMS.

BY M. EUGENE PELIGOT.

I PROPOSE to study the different chemical and physiological phenomena which follow each other during the life and the metamorphoses of the silk-worm.

In the first part of my work, I have followed the development of a given weight of larvæ, by determining the weight of mulberry leaves they consumed, that of the litter, and of the dejections which they leave as a residue. I have studied in the same manner, that is to say with the balance, the formation of the silk, of the chrysalis, and of the moth.

In the second part, which I shall shortly present to the Academy, I have endeavored to determine the chemical composition of the different substances obtained during the course of the weighed rearing. Taking as a point of departure the mulberry leaf, I applied myself to following the passage or the transformations of the vegetable and mineral matters which compose it into the products which I successively collected.

In order to arrive at comparable results, it is necessary to weigh or to calculate in the *dry state*, the different products of the *rearing;* these were done on a very small scale, in order not to exceed the limits of the weight which an accurate balance would bear. I have endeavored, nevertheless, to deviate as little as possible from the principles observed in the best managed *magnanaries*, and which I learnt by watchings for several years the *rearings* at the Bergeries of Senart, by M. Camille Beauvais.

By the side of the weighed lots experimented on, I had always a certain quantity of worms reared in the same manner, either for replacing sick or backward worms, or, for establishing, by comparison, the composition of the worms, at their different ages.

In order to ascertain the dry weight of the leaves distributed, I was obliged to retain each day for desiccation a certain weight of the fresh leaves, which I gave to the worms. The leaves to be distributed, and those to be kept, were weighed at the same time; the quantity of water which they contain is so variable, that it is not possible to proceed otherwise. The leaves which I employed contained from 17 to 32 per cent. of solid matters.

As regards the desication of the worms, which it is necessary to know in order to appreciate the increase of the worms by means of a given weight of leaves, experiment has proved that the quantity of dry matter which they contain is the same throughout the entire duration of their development, the aliments or dejections contained in the intestinal tube being deducted; in large or small worms, it represents only 14 hundredths of their weight, these worms being dried before or after they cast their skins, at which period they cease eating, or after a forced fast of 12 to 24 hours. When the worms are mature, after they have voided a great quantity of their solid and liquid dejections, it amounts to 20 per cent. Finally, for the larvæ which are in course of feeding, it increases regularly in proportion as they grow large, keeping between the two numbers which I have just given.

My memoir contains, in the form of tables,—

I. The weight of a hundred worms of various ages, in their natural state and in the dried state, after eating and after fasting.

II. The details of the weighed rearings which I made in the last three years.

These details comprise:

1. The weight of the fresh leaves given each day to a determined weight of worms.

2. The weight of these leaves in the dry state fixed by the desiccation of leaves collected and weighed at the same time.

3. The weight of the leaves not eaten dried at 230° F., which I designate under the name of *litter*.

4. The weight of the dejections separated from these leaves, and dried at the same temperature.

5. The weight of worms taken every two or three days. By subtracting from this weight that of the worm determined by the previous weighing, we learn the amount of their increase under the influence of the weighed leaves given to them; this quantity is calculated in the dry state by means of the elements given in one of these tables. The weight of the litter and that of the dejections, added to this quantity, are and ought to be almost equal to that of the leaves distributed, all these products being reduced by calculation to the dry state. The slight difference less which the sum of the first three elements presents, in proportion to the weight of the leaves, is due to the respiration of the worms; which this loss does not moreover accurately represent, all the errors of experiments being accumulated on this residue.

The examination of these tables leads to the following results, furnished by 1000 parts of leaves distributed.

	1849.	1850.	1851.
Leaves in the dry state .	292	271	266
Dried worms (14 per cent. of solid matters)	26	23	21
Litter left by these worms	134	134	124
Dejections produced . .	119	98	103

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By giving these results another form, it is seen that the worms left in the state of litter 45, 49 and 46 per cent. of the leaves which were distributed to them, and that 100 of leaves (in the dry state) produced 8 to 9 of worms and 40, 36, and 38 of dejections; that to acquire a dry weight represented by 100, the worms reject 450, 426 and 490 of residues of leaves or dejections; so that it may be admitted that the nutritive parts which the worms assimilate represent only about a sixth part of the leaves *which they eat*, the other five being returned in the form of dejections or serving for the respiration of the larvæ.

By means of these tables, it is easy to establish on positive bases the maximum of cocoon which a given weight of leaves exclusively employed in the nutrition of the worms can furnish. Knowing, indeed, that the weight of the mature worms represents scarcely half the weight of the cocoons which they ought to spin, we find that, deducting the leaf left as litter, 1000 of fresh leaves eaten, may give 166, 167, and 136 of fresh cocoons. But this is evidently a result which it is impossible to obtain in practice, since half of the leaves, and, ordinarily, much more, remains under the form of litter: it is known that a production of 60 parts of cocoons is considered by silk growers a very satisfactory result; we are therefore warranted in doubting the reality of the more than double productions which were announced some years ago.

Several facts which I have observed in the course of these studies, will perhaps merit the attention of the Academy.

It is known at the period of their maturity the worms empty themselves, freeing themselves from dejections and remains of undigested leaves which are found in their intestines; they then lose, in a few hours, from 8 to 10 per cent. of their weight. But this diminution of weight does not stop there: when the worm has selected the place for making its cocoons, and has there fixed its first thread, it also expels some solid dejections, green or white. These last contain a large quantity of uric acid. Some time after, it rids itself of a colorless and limpid liquid like water, but which presents a very distinct alkaline reaction; this kind of urine is not ammoniacal, as has hitherto been supposed; *it is a solution of carbonate of potassa*, containing 1·5 per cent. of that salt. Whence comes this dejection, whose quantity represents from 15 to 20 per cent. of the actual weight of the larvæ? What purpose does it serve? Entomologists will doubtless answer these questions.

Another observation which I have made relates to the more or less early maturation of the worms. With the view of determining by the loss of weight which these insects undergo owing to privation of food for a longer or a shorter time, I set two worms which had passed their last stage, but which still retained their appetite, to fast. They weighed 1·870 gr. each: they had not reached two-thirds of their growth, for those from among which they had been taken weighed, at full growth, 2·70 gr. to 3 gr. Nevertheless, after five days fasting, these two worms had turned white as if they had arrived at maturity, and they commenced their cocoons which, after the lapse of the ordinary time, were penetrated by male moths. These, like the cocoons, were very small; they weighed only 172 and 180 milligrammes, whilst the normal weight of these insects is from 400 to 500 milligrammes. The silk of each cocoon weighed 50 milligrammes, instead of 160 milligrammes, the average weight of my cocoons.

In a practical point of view this experiment seems to show that a cultivator, in case of a scarcity of leaves, may yet derive profit from the nearly mature worms whose feeding he cannot complete. The product of the crop, be it as small as it may, would still be proportional to the quantity of leaves consumed. As a scientific fact, it seems to me that it would be interesting to raise silk worms proceeding from parents of as meagre condition, with the view of determining to what extent it is hereditary, and of ascertaining the influence which it may exert on the quality of the silk.

The results which I have obtained, as regards the last part of the cultivation, namely, the produce of the worms in cocoons, that if the cocoons in silk and of the moths in eggs, agree sufficiently with those which were stated by Dandolo and by M. Robinet In fine, 100 grammes of worms which I raised, furnished 53·4 grof fresh cocoons; but these proportions are variable and difficult to be accurately established, for reasons which I give in my memoir.

In determining the quantity of silk left by each worm in the cocoon penetrated by the moth issuing from its metamorphosis, I arrived at this important result, *that the weight of the silk is far from being proportional to that of the worms or of the moths*: in other terms, that the heavy cocoons and the light cocoons contain about the same quantity of silk. The difference is due to the weight of the moths; for the males, it is comprised between 310 and 400 milligrammes, whilst the females ordinarily weigh more than twice as much. Half the weight of the latter belongs to the eggs which they afterwards lay.

Now, as it is probable that the female

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moths have issued from the heaviest worms, and which, consequently, have consumed proportionally the largest quantity of leaves, we arrive at this conclusion, that, if at the commencement of the culture and even where the larvæ have completed the casting of their skins, the males could be distinguished from the females, it would be profitable to sacrifice the latter (with the exception of those which must be kept for the production of eggs) in order to attend exclusively to the rearing of the males, which, consuming a smaller quantity of food, would furnish an equal quantity of silk. When we look at the enormous quantity of leaves which the worms consume a few days before their maturity, we understand the interest which this question presents as regards the cost of the silk.

Unfortunately, we have not yet arrived at distinguishing the sexes of silk-worms; we can, however, do so as regards the chrysalis and the moth, the females being much heavier than the males. There is nothing to prove that these differences of weight do not exist in the larvæ: it must be remarked that if they exist, the minute care which is taken to establish a perfect equality between the worms, by sacrificing the backward ones, by depriving of nourishment those which are forwarder than the others, these cares, which I am far from blaming, come in contradiction of the result which it would be required to prove.

I have opened a great number of mature larvæ and have separated the silk reservoirs or lobes, with the view of studying comparatively the silk and the crude matter which produces it, I have proved this unexpected fact, that the weight of the two lobes dried is perceptibly inferior to that of the silk furnished by worms taken in identical conditions; whilst the two dried lobes weigh on the average 100 milligrammes, the mean weight of the silk amounts to 160 milligrammes.

The result may be explained in two ways: is possible that the secretion of the silk continues in the worm whilst it is in the course of constructing its cocoon: it may also be supposed that, during its work, the worm adds to the substance in its lobes a foreign matter, that, for example, which the silk loses in being washed; in this case, the reservoir from which this matter flows remains to be discovered. For this and other reasons, the first hypothesis seems more probable.

In summing up the numerical data contained in the last part of my work, we find, in conclusion, that the worms furnish from 5 to 6 per cent. of their weight of silk. I have already indicated the quantity of leaves which they consume.—*Comptes Rendus*, No. 18, Nov. 3, 1851.

RESEARCHES INTO THE IDENTITY OF THE EXISTENCE OR FORCES, LIGHT, HEAT, ELECTRICITY, AND MAGNETISM.

BY JOHN GOODMAN, M.D.

In this communication the author describes the effects that were produced on a moderately sensitive galvanometer by exposure to the sun's rays, and which were observed by him during a period of four months, commencing on the 14th of November, 1850. The instrument is described as consisting of forty-six turns of covered copper wire, $\frac{1}{25}$th of an inch in diameter. The helix is blackened with ink at its southern extremity, and has a single magnetised sewing-needle suspended by about sixteen inches of silken fibre in its centre. The dial, which is of card-board, and divided into the usual number of degrees, rests upon the upper surface of the helix, and shades it from the ordinary light or sun's rays, except at its extremities, and occasionally some portions of the lower bundle of wires; and when the sun is very low the rays may be seen also to illumine to some extent the surface of the upper bundle. The indicator is formed of a slender filament of light wood in the usual manner, and the whole is enclosed in a glass shade. This instrument was placed for experiment in a window having a southern aspect; and whilst the sun was strongly shining upon it, it was frequently observed that there could not be obtained, either on account of vibrations or the erroneous condition of the instrument, any true indications. On shading the instrument from the sun's rays by a screen, the vibrations ceased, and the needle again adjusted itself north and south.

On removing the screen the needle began to vibrate, and was soon discovered to become stationary at some distance from zero, indicating the transmission of a current in the helix. This deflection of the needle was soon found to be always, under the same circumstances, in the same direction, and to give indications of a current corresponding to the brightness of the sun.

This action appeared to depend upon the incidence of the sun's rays upon the south extremity, and some of the lower or upper bundle of wires only of the helix: for when they began to illumine the opposite extremity, either very slight indications, or a neutral result, constant vibrations, or the

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movement of the needle some degrees in the opposite direction, were always observed. The maximum deflection, at any time attainable by the galvanometer, when the sun was quite unclouded, was about 12°, generally only 10°. It may be observed that in all these experiments the power of the rays was probably somewhat diminished by passing through the glass pane of the window, and through the glass shade of the instrument itself.

In order to show that the effect was not thermo-electric action, the extremities of the helix were removed from their mercury cups and wrapped in paper, so as to exclude the mercurialized portion of the copper from the action of the sun's rays; but no alteration occurred in the ordinary results of the experiments. There is, moreover, the author considers, no evidence on record of any thermo-electric action ensuing from the application of heat to copper wire alone, nor without the formation of a complete electrical circuit. But in these experiments hitherto the completion of the circuit had not been attempted. During the course of the experiments the circuit was established by means of a connecting wire between the mercury cups and the circuit was again and again completed, and as frequently broken, without any deviation occurring in any of the results, either during the progression, stationary condition, or decline of the needle.

That these phenomena were the result of the action of the sun's rays upon the helix itself, was further shown from the circumstance that when the sun remained clouded for days together, there was no deflection of the needle; that when the helix was partly shaded by a pillar, or the window-frame, the instrument indicated an amount of current corresponding to the number of coils of wire illumined; and *the illumination of the whole bundle of wires* at the southern extremity of the helix was necessary to produce the usual results, for when a burning lens of high power was employed to condense the rays and throw them in a focus upon one or two wires only, no deflection of the needle was observed. It was also further shown that the action of the rays upon the helix was attributable to that portion situate chiefly at the southern extremity, for the whole instrument was in a variety of ways and at different periods shaded from the solar rays; but its results were unaffected, unless the south end was obscured, when the needle immediately declined; or the north end was illumined when the deflections were lessened, or the motion of the needle took place in the opposite direction.

A pile of red-hot burning embers held in the vicinity of one extremity of the helix caused a slight deflection of $\frac{1}{20}$, and when held at the opposite extremity, caused a deflection in the opposite direction.

The author states a remarkable circumstance, viz. that vibrations and neutral action were observed during bright sunshine about the 11th of December, and again on the 23rd of January; that previous to the former period the deflections of the needle were to the *left-hand;* between these two periods they were to the *right-hand;* and after the latter period always to the left, after a given hour of the day. During the early sun, however, they were to the *right-hand,* and as the sun approached a given altitude, they were invariably to the *left-hand.* Deflections observed during the summer season were also to the *left-hand;* but those of the early sun were not submitted to the test.

On testing the instrument with a voltaic pair it was shown that the current passed from south to north *above the needle* with the *early sun,* or when the indicator deflected to the right-hand, and *beneath the needle* with the rays which proceeded from a *considerable elevation,* or when the needle deflected to the left-hand.

In conclusion, the author states that the results of these experiments evince to his mind more than ever the *unity of force;* and that experimental evidence appears to justify the conclusion at which he has long since arrived, *that there is one, only, universal force in nature, which is modified by the accidental and varied conditions to which it is subjected, but that its essential nature and characteristics are at all times unchangeably the same.—Royal Society.*

ON THE GASTRIC JUICE.

BY M. A. HUBBENET.

To obtain the gastric juice in the pure state M. Hübbenet made stomachal fistulas in two dogs and a sheep, after having tied the excretory ducts of the salivary glands.

The quantity of gastric juice secreted in one hour by a dog weighing 16 kilogrammes was, on the average, 76 grammes. The secretion of juice continues so long as the stomach contains food, and ceases only when the last residues of digestion have passed the pylorus. In the completely empty state, the stomach contains only a neutral or alkaline, viscid mucus.

The quantity of gastric juice secreted by a sheep appears to be much more considerable. In most cases, it amounted to 100 grammes in half an hour.

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The gastric juice is always acid. With Schmidt, the author attributes this acidity to the presence of hydrochloric acid, coupled with an animal matter (?)

The following is the composition of the gastric juice of the two dogs and the sheep. The following cyphers are averages of a great number of analyses made by M. Schmidt.

	GASTRIC JUICE		
	Free from saliva. Dog A.	Containing saliva. Dog B.	Of the Sheep.
Water	973·062	971·171	986·147
Dry Residue	26·938	28·829	13·853
Ferment	17·127	17·336	4·055
Hydrochloric acid	3·030	2·337	1·234
Chloride of potassium	1·125	1·073	1·518
Chloride of sodium	2·507	3·147	4·369
Chloride of calcium	0·624	1·661	0·114
Hydrochlorate of ammon.	0·468	0·537	0·473
Phosphate of lime	1·729	2·294	1·182
Phosphate of magnesia	0·226	0·323	0·577
Phosphate of iron	0·082	0·121	0·331
	26·918	28·829	13·853

To neutralise 100 parts of gastric juice, the following quantities of potassa were required on the average:—

Dog A. fed on meat	0·356
Dog B. fed on starch	0·390
Sheep	0·264

M. Hübbenet has made numerous experiments on the physiological action of the gastric juice. He has carefully studied the solvent action which this liquid exerts on the albuminoïd matters, and particularly on cooked albumen. The results which he has obtained in this respect, although interesting, add little to our knowledge on this point.

He concludes his work by examining the influence which is exerted on the phenomena of digestion by section of the *par vagum*. The following are the conclusions, at which he arrives in this respect. After section of the *par vagum*:—

1. The movements of the stomach do not cease.

2. Fifty, or seventy-five hours after the operation, the stomach of the animals does not present any pathological alteration.

3. The quantity of gastric juice secreted is not perceptibly diminished.

4. The composition of the gastric juice is not modified, with the exception of an increase, perhaps accidental, of the proportion of hydrochlorate of ammonia.

5. Cooked albumen is dissolved, but more slowly than in normal circumstances.

6. The animals are affected after the operation, with a very serious morbid state.—*Annalen der Chemie und Pharmacie.*

SUGAR IN THE URINE.

BY SIGNOR ALVARO REYNOSO.

In a former note, says the author (see The Chemist, New Series, No. XXXII, December 1851, page 117), I announced that there exists a connection between the respiratory phenomena and the presence of sugar in the urine, so that all substances which retard respiration by diminishing the hœmatosin produced in the lungs, are so many causes which might, in my opinion, determine the passage of sugar into the urine. I added that, according to this principle, we ought to find sugar in the urine of persons subjected to hyposthenisant treatment; and in order to enumerate them in a word, we shall only have to quote the beautiful generalisation of M. E. Robin. According to him, the substances which, after death, preserve from the slow combustion effected by humid oxygen, are, in different degrees, hyposthenisants during life. For example, the metallic salts, the ethers, the salts of quinine, and, in general, the narcotics.

Having examined the urines of persons submitted to treatment with bichloride, iodide and sulphuret of mercury, satts of antimony, opium and sulphate of quinine, we found sugar. The experiment was easily made, thanks to the kindness of M.M. Cullerier, Vidal de Cassis and Becquerel, to whose obligingness I am happy to have an opportunity of testifying.

We now wait to see how soon after the cessation of the above mentioned treatments the sugar completely disappears from the urine, and if there is a coincidence between the disappearance and the complete elimination of the medicament.—*Comptes Rendus*, No. 19, Nov. 10, 1851.

ON THE FORMATION OF DOLOMITE BY THE ACTION OF MAGNESIUM VAPORS.

BY M. DUROCHER.

Pieces of a porus limestone and anhydrous chloride of magnesium were introduced into a gun-barrel, so that neither substances were in contact. The closed tube was then exposed for three hours to a dull red heat, in order to maintain an atmosphere of chloride of magnesium vapor round the limestone. At the end of that time the pieces of limestone were found to be covered with a crust of fused chloride of calcium and chloride of magnesium, mixed with a little peroxide of iron and the oxides of the two earths. The chlorides were

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separated by washing with water, and the nuclei were thus found to be partially converted into dolomite. On the addition of hydrochloric acid, the limestone which had not been altered dissolved first with strong effervescence, which subsequently became less energetic, as is the case with dolomite. Transparent groups of crystals were visible under the microscope; the mass had a white color passing into yellow and greyish-yellow, and was, like dolomite, full of cavities. Durocher is of opinion, that the assumption of some geologists, that dolomite has been formed naturally by aqueous agency, is proved by this experiment not to be absolutely correct, as it may also have been formed by magnesium vapors issuing from the interior of the earth, and gradually converting limestone into dolomite.— *Comptes Rendus*, vol. xxxiii. p. 64.

ON THE DEPORTMENT OF WATER TOWARDS THE CARBONIC ACID IN THE CARBONATES OF THE PROTOXIDE OF MANGANESE AND OXIDE OF LEAD.

BY PROFESSOR H. ROSE.

WATER expels less carbonic acid from the protocarbonate of manganese than from many other carbonates. By decomposing solutions of equivalents of protosulphate of manganese and carbonate of soda, a compound consisting of 5 atoms of protoxide of manganese with 1 atom of the hydrate of the protoxide is most frequently formed; of eleven precipitates examined, four contained such a proportion between the carbonic acid and protoxide of manganese as would correspond to such a compound. Some of the compounds of the protocarbonate of manganese with the hydrate of the protoxide absorb at 212° a very small quantity of carbonic acid from the atmosphere, as is the case with several of the combinations of the carbonate of magnesia with the hydrate.

When the compounds are heated to 300°, they gradually become dark brown. The protocarbonate remains unaltered, but the hydrate of the protoxide is oxidised into hydrated sesquioxide. At 392° the protocarbonate is likewise converted into hydrated sesquioxide.

COMBINATIONS OF CARBONIC ACID AND WATER WITH OXIDE OF LEAD.

Formerly the precipitate which is obtained from solutions of soluble lead salts with a neutral alkaline carbonate was regarded as neutral carbonate of lead; it however contains water, although only in small quantity, and less carbonic acid than is required to form a perfectly neutral compound. When solutions of equivalents of nitrate of lead and carbonate of soda are mixed, the compound $6PbO, CO^2+PbO, HO+HO$ is obtained from concentrated cold solutions; at 392° it parts with water, and absorbs carbonic acid; with dilute cold solutions the compound $5PbO, CO^2+PbO\ HO$ is formed, which is likewise obtained from concentrated hot solutions; from dilute hot solutions, on the contrary, the compound $3PbO, CO^2+PbO, HO$ falls. When a solution of the nitrate of lead is precipitated with an excess of carbonate of soda, the precipitate contains some soda; but it is essentially $2PbO, CO^2+PbO, HO$, which compound, according to the experiments of Mulder and Hochstetter, is likewise principally formed in the preparation of white lead.—*Bericht der Berlin Acad.*, 1851, p. 597.

ON THE FORMATION OF ANHYDROUS CRYSTALLISED ALUM.

BY THE PRINCE OF SALM HORSTMAR.

ALUMINA, obtained by precipitating ammonia-alum by ammonia and heating the precipitate to redness, was fused with four times its weight of bisulphate of potassa; on treatment of the fused mass with water, six-sided tables which did not doubly refract light were left, and on analysis were found to consist of anhydrous alum.— *Journ. für Prakt. Chem.* vol. lii. p. 319.

ON THE COMPOSITION OF THE GASES EVOLVED IN THE PRODUCTION OF COKE FROM COAL.

BY M. EBELMEN.

THE question might arise, whether in the formation of coke from coal in a furnace, the air which enters the furnace gives up its oxygen to the matters which are evolved in the gaseous state, or to the solid carbon; and again, whether the oxygen forms carbonic oxide or carbonic acid. Ebelmen examined the composition of the gases of the coke-ovens at Seraing, and found that more than two-thirds of the hydrogen of the coal is burned, the remainder existing in the evolved gaseous mixture. The quantity of carbonic acid is three times that of the carbonic oxide.—*Comptes Rendus.*

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INTRODUCTION TO THE STUDY OF CHEMISTRY.

NO. VI.

IODINE. I. 126.

THIS simple substance was discovered in 1811 or 1812, by Bernard Courtois. The circumstances of the discovery are given at page 36 of this volume, in a memoir of Courtois, by M. Cap.

The source from which iodine is obtained in the large way is the kelp from the West coast of Ireland and the Western Islands of Scotland. The long white stems of the *Fucus palmatus*, a deep-sea plant, are said to contain the largest quantity of it. It has likewise long been known to exist in sea-water, sponge, certain saline springs, plants growing near the sea, the coarser kinds of common salt &c. Vauquelin found it in some silver ores of Mexico, and Bustamente detected it in a native carbonate of lead from Mexico, as well as in a kind of agave. Its presence has also been proved in cod and skate liver oils; in the *Nasturtium aquaticum* by Muller; and by Holl in the yellow sap of *Iulus fetidissimus*. M. Chatin has recently found it in numerous fresh-water plants and animals; in terrestrial plants and animals; in wine, cider and perry; in milk and eggs; in arable land &c. (THE CHEMIST, New Series, Vol. I., page 352, and Vol. II., page 67). M. Marchand and M. Personne have also found iodine in fresh water. M. Bussy has found it in the products of the distillation of coal; and M. M. Lembert in calcareous rocks. See THE CHEMIST, New Series, Vol. I., pp. 15, 158, 254, 257, 352, 405, 443, 488, 498 and 534, and Vol. II., pp. 67, 112, 193, 355, 401 and 529 for very interesting papers on iodine).

Iodine has been examined by Vauquelin and Davy, and, more particularly, by Gay-Lussac.

PREPARATION.—The following description of the process of preparing iodine in the large way at Glasgow, is taken from Professor Graham's Elements of Chemistry, (edition of 1842.)

"The greater part of the iodine of commerce is prepared at Glasgow from the kelp of the West coast of Ireland, and the Western Islands of Scotland. The sea-weed thrown upon the beach is collected, dried, and afterwards burned in a shallow pit, in which the ashes accumulate and melt by the heat, being of a fusible material. The fused mass broken into lumps forms kelp, which was prepared and chiefly valued at one time for the carbonate of soda it contains, which varies from 2 to 5 per cent. It is not all equally rich in iodine. According to Mr. Whitelaw, the long elastic stems of the *Fucus Palmatus* afford most of the iodine contained in kelp, and the kelp prepared from this plant may be recognised by the presence of charred portions of the stems, and as that is a deep-sea plant, it is found in largest quantity in the sea-wreck of exposed coasts. A high temperature in the preparation of the kelp, which increases the proportion of the alkaline carbonate, diminishes that of the iodine owing to the volatility of the iodide of sodium at a full red heat. The kelp which contains most iodine, generally also contains most chloride of potassium, and it is for these two products that the substance is now valued, more than for its alkali.

"The kelp broken into small pieces is lixiviated in water, to which it yields about half its weight of salts. The solution is evaporated down in an open pan, and when concentrated to a certain point, begins to deposit its soda salts, namely, common salt, carbonate and sulphate of soda, which are removed from the boiling liquor by means of a shovel pierced with holes like a colander. The liquid is afterwards run into a shallow pan to cool, in which it deposits a crop of crystals of chloride of potassium; the same operations are repeated upon the mother-ley of the crystals until it is exhausted. A dense dark colored liquid remains, which contains the iodine, in the form, it is believed, of iodide of sodium, but mixed with a large quantity of other salts, and this is called the iodine ley.

"To this ley, sulphuric acid is added in such quantity as to leave the liquid very sour, which causes an evolution of carbonic acid, sulphuretted hydrogen, and sulphurous acid gases, with a considerable deposition of sulphur. After standing a day or two, the ley so prepared, is treated with peroxide of manganese, to separate the iodine. This operation is conducted in a leaden retort, of a cylindrical form, supported in a sand-bath, which is heated by a small fire below. The retort has a large opening, to which a capital [still-head] is adapted, and luted with pipe-clay. In the capital itself there are two openings, a larger and a smaller, closed by leaden stoppers. A series of bottles, having each two openings, connected together and with their joinings luted, are used as condensers. The prepared ley being heated to about 140° in the retort, the manganese is then introduced and the capital is fixed on and luted. Iodine immediately begins to come off, and proceeds on to the condensers, in which it is collected; the progress of its evolution is watched by

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occasionally removing the smaller stopper of the capital, and additions of sulphuric acid or manganese are made if deemed necessary. The success of the experiment depends much upon its being slowly conducted, and upon the proper management of the temperature, which is more easily regulated when the quantities of materials are considerable than when this experiment is attempted with small quantities in glass flasks. In the latter circumstance, chlorine is often evolved with the iodine, and is lost; but this accident can be avoided in the manufacturing process. A little cyanide of iodine often accompanies the iodine, which being more volatile, condenses in the form of white, flexible prismatic crystals, in the bottle most distant from the leaden retort.

In this operation, the peroxide of manganese will be in contact at once with hydriodic, hydrochloric and sulphuric acids; and the iodine of the hydriodic acid may be liberated, from the union with its hydrogen of the oxygen of the manganese, and the formation of water; or hydrochloric acid may be first decomposed by the manganese, and chlorine decompose the hydriodic acid and liberate iodine. If a considerable excess of sulphuric acid be employed, iodine is obtained without the use of the peroxide of manganese, the oxygen required by the hydrogen of the hydriodic acid being supplied by the sulphuric acid, a part of which is converted into sulphurous acid. The presence of iodine in the prepared ley may be observed by suddenly mixing it with an equal volume of oil of vitriol, when violet fumes of iodine appear. But the quantity of iodine may be more accurately estimated by means of a solution consisting of 1 part of crystallised sulphate of copper and 2½ parts of protosulpate of iron, which throws down an insoluble subiodide of copper, almost white."

New modes of obtaining iodine are described by Mr. C. Watt, jun., (THE CHEMIST, New Series, Vol. I., page 158); Dr. Kemp, (Ibid, page 498), and Sig. E. Bechi, (Vol. II., page 529), which we recommend to the study of our readers.

To prepare perfectly pure iodine, M. Millon passes chlorine into pure iodide of potassium in solution in water, until the iodine liberated is redissolved; he then pours the solution into another containing at least three times as much iodide of potassium; the iodine is precipitated, and merely requires to be washed and dried.

Commercial iodine may be purified by dissolving in alcohol, filtering, and precipitating by the addition of water.

PROPERTIES.—Iodine occurs in crystalline scales, of a grey or bluish-black color, with a metallic lustre and a greasy and lamellar fracture. It is soft and friable. Its specific gravity is 4·946 (Gay-Lussac). It stains the skin yellow. Its specific heat, according to Regnault, is 0·05412. Its odor is similar to that of chlorine; it has an acrid taste. When humid, it is highly volatile, giving off violet vapors at between 60° and 80° F. The vapor is more abundant at from 120° to 130° F.; it fuses at 220° and boils at 350°, giving off dense violet fumes, condensing in brilliant plates and acute octohedrons. 100 cubic inches of vapor weigh 270·8036 grains. The specific gravity of the vapor, compared with atmospheric air as unity, is 8·7356, and with hydrogen 126. Dumas found the density of the vapor of iodine to be 8·716. Pure water dissolves only $\frac{1}{7000}$th of its weight of iodine, and assumes a brown color; this color disappears by exposure to the sunshine, iodic and hydriodic acids being formed. Alcohol and ether dissolve much larger quantities of iodine, forming deep brown solutions.

In many cases, the violet vapor of iodine is a sufficient indication of its presence, but its property of forming a blue compound with starch is a far more delicate test. This was discovered by Colin and Gaultier de Claubry. Stromeyer states that a solution of starch communicates a blue tinge to a liquid containing $\frac{1}{450000}$th of its weight of iodine; he adds, that to ensure success, the iodine must be free, and the solution cold, as heat destroys the color; in cases when the quantity of iodine present is extremely minute, it may be a few minutes before the coloration occurs. As chlorine decomposes the compounds of iodine, it may sometimes be used as a test for the presence of iodine.

The mode of testing for iodine suggested and practiced by Mr. C. Watt, jun., will be found in Vol. I., page 158: those of Reynoso and Casaseca, at pp. 15 and 488 of the same volume: and those of Rabourdin, Lassaigne and Dr. Price, in Vol. II., pp. 193, 355 and 549.

The principal uses of iodine are in medicine and the Daguerreotype. It was introduced into medicine by Coindet, of Geneva. In over-doses it is an irritant poison. It has also been used for the production of some rich colors in calico-printing.

We shall reserve the compounds of iodine with oxygen and chlorine for our next paper.

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ON THE WATER MELON (CUCURBITA CITRULLUS L.)

BY M. LENOBLE, OF MONTERIDEO.

THE water melon, which is very abundant here, belongs to the family of Cucurbitaceæ; its surface is ordinarily green, and its pulp red, containing much juice, and readily giving in the month. It contains a large quantity of blackish seeds, each enclosed in a peculiar partition, in the midst of the pulp. (RICHARD *Botanique Medicale*, 1823.)

As the aqueous part of this pulp is very sweet, I was curious to know what was the difference which existed, as regards the quantity of sugar between the water melon and the sugar-cane. For this purpose, I operated on 100 parts of water melon reduced to a paste; the latter gave by pressure 70 parts of juice of a light rose color, possessing the power of slightly reddening litmus paper; this same juice mixed with a small quantity of lime-water, and subjected to the temperature of 212° F., was clarified and decolored, producing, besides, an albuminous coagulum.

By means of prompt evaporation, this juice was reduced to the consistence of a syrup; this, further evaporated, produced a small quantity of crystallised sugar; the rest was converted into molasses.

Thus 100 parts of water melon are composed of:—

Water.....	67
Saccharine matter...	3
Residue.....	30

Water melons being much more saccharine than others I thought it necessary to repeat the experiment, but the produce has not exceeded the average of 3 per cent.

Having read M. Melsen's process, in the *Constitutionnel*, by which he obtained a much more considerable proportion of sugar than has hitherto been procured, I repeated the experiment in the same proportions. The results were better. Not only was almost all the sugar obtained crystallised, but I also obtained 2 per cent. more.—*Journal de Pharmacie*, Nov. 1851.

ON THE SPONTANEOUS DECOMPOCOMPOSITION OF GUN-COTTON, AND ITS CONGENERS,

BY J. H GLADSTONE, PH.D.

THE author having had occasion some time ago to prepare a variety of samples of the different substances produced by the action of nitric acid on woody fibre, starch, sugar, gum, &c., and having found that several of the samples, after being kept for some time, had undergone either partial or complete decomposition, describes the phenomena which were observed in each instance. From the observations recorded the following general conclusion is drawn, with reference to the spontaneous decomposition of gun cotton and its congeners:—that substances of this character have a tendency to suffer alteration in process of time from half the oxygen of the peroxide of nitrogen, NO^4, they contain, separating from the remaining NO^2, which escapes as nitric oxide gas, and combining with the organic substance, so as to form non-azotized acids, oxidizing at the same time a portion of the hydrogen, and causing it to be given off as water.—*Chemical Society*.

II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

RESEARCHES ON THE NUTRITION OF OATS, PARTICULARLY AS REGARDS THE INORGANIC MATTERS WHICH ARE NECESSARY FOR THEIR NUTRITION.

BY THE PRINCE OF SALM HORSTMAR.

(*Continued from page* 124.)

11. The phosphate of iron is very well supported by the oat as a source of iron (experiment No. XVIII.) We may likewise put into a medium of quartz hydrated oxide of iron to serve as a source of iron (experiment No. XXXII.) because the mass of quartz is speedily colored green by silicic infusoria which here explain the action of the hydrated oxide.

12. The fluoride of calcium restrains the growth of the oat plant and prevents flowering, even when it is introduced in small quantity into the mass (experiment No. XLII.)

13. Normal fructification did not succeed

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in quartz even with the addition of the seven inorganic substances abovementioned, together with nitrogenous bodies; it was only the counter proofs in calcined river sand (experiments No. XXXIII. and XXXIV.) and river sand purified with hydrochloric acid (No. XXXV.) which made a remarkable exception; these two experiments demonstrated that the failure should not be attributed to the season. These counter proofs also show that, since the seven inorganic bodies, united with nitrogenous substances, were sufficient in these two cases, they should also have been so for quartz, and have furnished whatever was necessary for a normal fructification; that if that did not take place, it was because the river sand contains a certain inorganic substance which is not met with in the series of the seven inorganic bodies, but which is especially indispensable to fructification.

14. Alumina seems almost to be one of those substances indispensable to fructification; this conclusion would appear to result, in some measure, from the experiment No. XXVII., made with hydrate of alumina, and in which were produced two fruits capable of germinating; from experiment No. XXXI. with artificial silicate of alumina in which were produced two fruits capable of germinating: and from experiment No. XXX. with the felspar of Baveno, which also gave as a result two fruits capable of germinating. Experiment No. XXXII., with zeolite (stolecite) of Iceland (free from soda) having produced no fruit, would seem to prove the contrary, since it is a silicate of alumina.

15. Experiment No. XXVIII. with 3 decigrammes of argil of Almeroden (slightly calcined) having produced five fruits capable of germinating, seems to prove that this argil, besides the alumina necessary, also contains one of the inorganic substances which are indispensable for fructification. This is so much the more probable, as the alumina contained in this argil weighed only 6 centigrammes, and as after having been calcined, it was not more soluble than the hydrate of alumina of experiment No. XXVII., which produced much less fruit. The argil of Almeroden, washed, contains, according to Forchammer, besides silicate of alumina, about 13 per cent. of potassa, manganese, iron and traces of lime (probably also traces of soda).

16. The formation of lateral shoots deserves particular attention as regards fructification. In the experiments in which lateral shoots appeared, the period of their appearance must be distinguished according to the periods of vegetation of the plants of the experiment and according to the number of fruits. The lateral shoots are always developed a little before, or at the same time, as the flowers appear, and this phenomenon was always manifested in the experiments in which there was no fructification.

In experiment No. XXVII. with hydrate of alumina having produced two fruits, in experiment No. XXXI. with silicate of alumina and potassa having produced two fruits capable of germinating; in experiment No. XXX., with felspar of Baveno having produced two fruits, we see, on the contrary, lateral shoots appear after the flowering of the principal stem. These shoots attained a certain length; they even (experiment No. XXXII.) bore five flowers. On the other hand, in experiment No. XXVIII., with argil of Almeroden, having produced five complete fruits, we see, and this is very curious, two lateral shoots appear only at the commencement of the fructification.

It is necessary also to consider the case in which no lateral shoot was developed, which case was presented in the calcined river sand (Nos. XXXIII., XXXIV., and XXXV.,) which produced six, eight, and nine complete fruits. By uniting into one whole the numbers of flowers, fruits, and lateral shoots produced in these different cases, we obtain the following table:—

Experiment		Flowers.	Fruits.	Lateral Shoots.
XXVII.	With hydrate of magnesia ..	7	2	2
XXVIII.	With argil of Almeroden....	8	5	2
				very small.
XXX.	With felspar of Baveno.....	4	2	2
XXXI.	With artificial silicate of potassa and alumina	6	2	2
XXXII.	With counter proof in calcined river sand	8	6	0
XXXIV.	With counter proof in calcined river sand.....	9	8	0
XXXV.	With river sand purified by hydrochloric acid	11	9	0

We thus find that the proportion of the number of the flowers to that of the fruits, is:—

In Experiment, No. XXVIII., as 8 is to 5.
In Experiment, No. XXX., . . as 8 is to 6.

This proportion is almost equal in these two experiments, and therefore it is astonishing that, notwithstanding this similarity, the vegetation of the plant in river sand ceases with the maturation of the fruit, whilst it does not cease in the plant grown in quartz containing 5 decigrammes of argil of Almeroden, and whilst it even produces two very small lateral shoots after the maturation of the fruit.

We should therefore find in this fact a

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new proof that these 3 decigrammes of argil, of Almeroden contained, besides aluminal one or other of the inorganic matters necessary to normal fructification; but this matter was not in sufficient quantity for producing the number of fruits which is necessary for the maintenance of the vital force of this annual plant, and for the normal termination of the vegetation.

17. The experiment made with 3 decigrammes of argil of Almeroden, washed and slightly calcined in contact with the atmosphere, is also interesting as measuring the extreme limits of the desired quantities of certain substances necessary to fructification, inorganic substances which are contained in these 3 decigrammes of argil. It follows that the formation of five fruits completely exhausted this special, undetermined substance, which the plant found in the argil, for there is also found in the mass, after fructification, sufficient free vital force to produce two small lateral shoots; if this free vital force had found sufficient of the undetermined inorganic substance, there would certainly have been a further production of fruits, for the other bodies were not deficient, as is proved by experiment No. XXXV.

18, The oat presents a peculiarity in calcined river sand, in experiment No. XXXVII. this sand had, besides the ordinary additional substances, received chloride of potassium and carbonate of soda. In this case, the lateral shoots appeared before the development of the stalk of the principal stem. Thus, the formation of lateral shoots here took place in the same period of vegetation as in the case of the oat grown on vigorous soil in the fields; at the same time, there was an increase in the production of fruits, by the fruits of one of these lateral shoots.

It would seem possible to admit that the augmentation of the production of the fruits by the formation of lateral stems arises from the 5 milligrammes of chloride of potassium and 1 milligramme of carbonate of soda, or of one of them, for this phenomenon was not manifested in the same river sand, deprived of these two bodies. This experiment would likewise lead us to think that chloride of potassium contains at least one of these substances specifically necessary for fructification. Is it the chlorine and the soda, or one of the two, that acted? This must be determined by new experiments, and we intend to undertake them. It is very curious that these two bodies, united to powdered flint (No. XXXVIII.,) produced no fruit.

19. The appearance of lateral shoots, in plants grown in quartz with or after the maturation of the fruits, seems to furnish a sign of a nature to indicate the partial or total absence of the bodies necessary for fructification; we think that this new sign must be used as a verification, because, we might be led in Nos. XXVII. and XXVIII., in which two fruits capable of germinating were formed, to regard the alumina as the determining and specific cause of the fructification, whilst, taking account of this sign, it may be found that the alumina here was completely useless, and that it was perhaps a little soda retained in the alumina or in the silicate of alumina and potassa which was the sole cause of it; and this explanation seems the more probable when we refer to the analyis of the ashes of the oat, all of which tell for soda and against alumina, and when we reason according to experiments XXXII. and XXXVII.

The oat ought, as an annual plant, to terminate its vegetation entirely with the full maturation of the fruit; this process should take place regularly when it is known that the plant has received all the necessary nutritive substances, in sufficient quantity and in the desired order of succession.

20. In all the experiments, it was remarked that a small, clear and colorless drop was formed, at the end of the first leaf, at the commencement of its appearance: this drop showed itself at the point, after the setting of the sun; it became large during the night, and disappeared during the day, except in very damp weather; this drop contained gum. The drop richest in gum which was observed was taken from an oat plant grown in sugar charcoal without inorganic additional substances, but with 4 decigrammes of nitrate of ammonia (dissolved in 8 grammes of water.) When the leaf continues to be developed, the phenomena disappears. This phenomenon appeared only on the first leaf, never on any of the other leaves.

During the day, the dry gum was seen remaining suspended on the point of the leaf. This phenomenon is independent of the soil, for it was observed on pure sand, river sand, quartz and sugar charcoal. It was also remarked in the germinative test of the fruits obtained in the experiments; it was particularly well marked in the plants resulting from the two fruits obtained in experiment No. III.; the drop in that case remained for a longer time during the day. The drop was likewise found in the germinative test of the fruits of experiments XIII. XIV. and XXVII., but it was backward, because the first leaf was developed more slowly (all the germinative tests were

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made in pure sand.) The phenomenon of the drop often ceases at the end of two days.

21. In the germinative test of the fruits of experiments XIII. XIV. and XXVII., there was found a slightly abnormal development of the first leaf, for when it issued from the sheath, it retained the form of the stalk, and was 3 centimetres in length; it did not unfold towards the point; afterwards, however, it unfolded normally. This peculiarity proves ordinarily a disturbance in the development of the roots; it was not remarked in the other germinative tests, especially in that of the five fruits of experiment No. XXVIII. (argil of Almeroden.)

22. An oat plant, which was developed as far as the first or second leaf in powdered quartz deprived of inorganic additional substances, did not support an addition of 2 centigrammes of nitrate of ammonia dissolved in 5 grammes of water; it was covered with yellow stains: that which the plant should absorb of this last-named body, must be absorbed immediately in the soil during germination; otherwise the organism, and especially the radicular development, is disturbed.

23. A soil is in some measure analysed by the plants, which indicate whether it contains all the substances necessary for their vegetation in such a condition that these plants can assimilate them. If this point is admitted, it may also be inferred as a consequence, that it would perhaps be advantageous to use the method employed in the foregoing series of experiments (the addition of various substances in separate vessels) for estimating in certain cases some natural soils; by that means, we should arrive at determining the substances which are wanting, much better than by having recourse to analyses of the soil which, as is known, are not always satisfactory.

Although it may be admitted that we have proved synthetically, by the foregoing, the necessity of inorganic matters as well as that of nitrogenous combinations in the soil as regards the vegetation of oats, and that we have thus put in evidence most of the inorganic substances necessary for the different vegetative phases (the question of the chlorine excepted) to complete flowering, it is no less true that it still remains to find and designate the special substance which is necessary for fructification, which will form the subject of new investigations on our part.—*Annales de Chimie et de Physique.*

(To be concluded in our next.)

IMPROVEMENTS IN PHOTOGRAPHY.

PATENT GRANTED TO WILLIAM HENRY FOX TALBOT, ESQ.

THE first part of this invention consists in obtaining photographic images on plates of glass prepared by the following means:—A plate of glass should be selected having a smooth and well-polished surface; and in order to obtain a photographic picture the operator proceeds as follows:—

1. He takes albumen, or white of egg, and mixes the most liquid portions thereof (rejecting the rest) with an equal quantity of water, and having spread the mixture smoothly and evenly over the surface of the glass, allows it to dry spontaneously, or dries it at a fire.

2. He mixes an aqueous solution of nitrate of silver with a large proportion of alcohol, so that the mixture shall contain about three grains of the nitrate to each ounce of liquid. (This proportion may be varied from one to six grains in the ounce of liquid; but three grains is considered to be the best proportion.)

3. He dips the prepared plate for a few seconds into this mixture, then withdraws and dries it by a gentle heat, or allows it to dry spontaneously.

4. He dips the plate into distilled water, to remove any superfluous nitrate of silver.

5. He applies a second coating of albumen in the same way as above directed, and dries the plate by the application of gentle heat, avoiding the use of too much heat, by which the nitrate of silver might be decomposed.

6. He takes an aqueous solution of protiodide of iron, containing 140 grains of the protiodide to the ounce of water. A small quantity of free iodine in the solution, by which its color would be rendered slightly yellow, will be found to be of advantage. To one measure of the solution he adds one of acetic acid and ten of alcohol, and allows the mixture to stand for a few days previous to use.

7. He dips the plate into the solution, or allows the liquid to pass over the whole of its surface in a continuous stream. It is then dried, when it should be of a pale yellow color, very clear, and uniformly transparent; and this completes the preparation of the plate. All the preceding operations may be performed in moderate daylight, but avoiding exposure to too strong a light, or to sunshine.

8. When it is desired to obtain a photographic picture, the operator takes a solution of nitrate of silver containing one hundred grains of nitrate of silver to an ounce

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of water, and, having mixed two measures of the same with two of acetic acid and one of water," he "dips the albuminiesd plate therein once or twice, for a few seconds each time (performing the operation in a darkened room or by candlelight), for the purpose of rendering it sensitive. If the weather is cold, the plate should be slightly warmed before so dipping it. He then removes it to the camera without loss of time, as the plate ought to be used a few minutes after taking it out of the solution; and when a sufficiently strong photographic image is supposed to be obtained, the plate is transferred from the camera to the dark chamber or operating room.

9. It is then immersed in a solution of sulphate of iron, composed by mixing one measure of a saturated solution thereof in water with two measures of water (but the solution may be stronger or weaker, at the discretion of the operator), by which the previously invisible images will be rapidly rendered perceptible.

10. The plate is then washed, and dipped in a rather strong solution of hyposulphite of soda in water, which, generally, in about a minute renders every part of the image more distinct and visible. The picture is then washed in distilled water, and the surface of the plate may be cleansed from any particles of dust, or other impurities, by rubbing it gently with cotton dipped in water; and if the above-described operations have been properly performed, the surface of the plate will not be at all injured by this cleaning. The picture is then dried, and the operation is finished. For the purpose of better preserving the picture, the plate may be covered with a coating of albumen or fine transparent varnish.

Although throughout the above processes certain proportions of chemical substances have been named, they may be varied very considerably, as is also the case in photographic operations generally.

The images obtained by his improved method, Mr. Talbot calls "*Amphitypes*," because they appear either positive or negative, according to the circumstances of light under which they are viewed. Thus, if held against a bright light, or against a sheet of white paper, they appear negative, and the reverse when held against a black surface and seen in obliquely reflected light. It is in the power of the operator, by varying the proportions of the chemicals employed, to obtain at pleasure positive images more or less distinct in comparison with the negative images. When it is intended to copy the image upon paper, it is desirable to obtain as strong a negative as possible on the glass plate, which is then copied on the paper, to produce thereon a positive image in the usual manner; but when the operator wishes to have a picture on the glass, he should endeavor to obtain a strong positive image. When this is obtained to his satisfaction, it may be preserved from injury and from contact of the air, by pouring black paint over the pictured side of the plate, and then by turning the glass the picture will be seen correctly, and not reversed as regards the right and left sides. This method of blacking one side of the plate is not however any part of the present invention. Throughout the specification the words negative and positive are made use of in the sense in which they are generally employed by photographers, viz., a positive image is that in which the lights and shades of the object are represented by lights and shades on the photograph, and a negative imuge is that in which a reverse effect is produced.

The method of operating just described is that which Mr. Talbot recommends when the object is close at hand, and the operator is in the vicinity of a darkened room, to which he can retire for the purpose of rendering his plates sensitive; but under circumstances where the object is at a distance, and when the operator is on a journey or otherwise removed from any house or place where such conveniences exist, the following method of procedure may be adopted:—The operator constructs a glass cell with equal and parallel sides, open at the top and closed at the bottom and sides, and quite watertight, of a size just sufficient to receive one of the photographic plates, but not much greater, in order that there may be no waste of the chemicals employed. The posterior glass of the cell has one of its sides ground or unpolished, and the cell, when in use, is placed at the hinder part of the camera, so that, when directed towards an object, the unpolished or ground surface may answer the purpose of the sheet of ground glass introduced in cameras to place the objects in their true focus. Allowance must, of course, be made for the unusual position occupied by the ground glass in this case. The top of the cell is provided at one corner with a funnel for the introduction of liquid, and the bottom is furnished with a stop-cock and waste-pipe terminating in a caoutchouc tube, which may be moved by hand from one to the other of two vessels which are provided to receive the used liquors escaping from the camera: the nitrate of silver solution is too expensive to be wasted, but the other ingredients, when once used, may be thrown away. These preparations made, the operator pours

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into the cell a quantity of liquid sufficient to fill it nearly full when it contains one of the photographic plates, and notes the quantity required. He then provides four bottles of that capacity, one of which he fills with solution of nitrate of silver, prepared as before directed under operation 8; the second bottle is to contain a solution of sulphate of iron, as directed under operation 9; the third bottle is filled with water, and the fourth with a strong solution of hyposulphite of soda. These quantities are sufficient for obtaining a single photographic picture, and when they are used the bottles must be filled again. Having prepared a number of glass plates by means of the processes before described up to No. 7 inclusive, they are to be placed in a box ready for use: the operator, when he desires to obtain a photographic picture of an object, takes one of the plates from the box (which he can do without injury to it, as the plates in this condition are not sensitive to light), and places it in the camera, the focus of which he adjusts to the object. He then closes the front lens or object-glass, lowers a curtain over the camera box, leaving exposed only the funnel at the top (and care should be taken to guard against any light entering through this) and the waste pipe at the bottom of the cell, and pours into the cell through the funnel the contents of the first bottle (nitrate of silver solution), for the purpose of rendering the plate sensitive to light. He may then proceed in two different ways. That is, he may open the front lens, and obtain the image while the plate is immersed in the solution; or, before opening the front lens, he may allow the nitrate of silver solution to escape through the waste pipe, and he will then obtain an image on the plate while the liquid is adhering to its sides. In the latter case, or after allowing the solution to escape, if the former method is adopted, he closes the stop-cock, and successively pours into the cell the contents of the second and third bottles, allowing each to remain in for about half a minute; and, finally, he pours in the hyposulphite of soda solution, after which the plate is removed, and the image being now fixed, and not liable to injury from exposure to air, the plate is washed and placed in a box to be finished and varnished when the days' operations are completed. Another method, but one which is less simple, is to use four bottles of larger size than those above described, but contaning the same liquids These bottles are placed on a stand above the camera, and from each of them descends a tube of India-rubber furnished with two stop-cocks, which are placed at such distances apart, that the interval of tube between them shall be of a capacity equal to that of the cell when it contains a plate. These tubes dip into a funnel which communicates by a suitable pipe with the funnel leading to the cell. The liquids are successively supplied to the cell from the bottles, and the method of operating according to this system is the same as that just described. The images obtained on glass by these means may be copied on to paper in the usual manner. In fixing the images on paper, it is recommended, after washing them, to immerse the paper in a hot solution of iodide of potassium, before dipping in the solution of hyposulphite of soda, by which means a better fixation of the image will be obtained.

Under this branch of his invention Mr. Talbot claims the mode of preparing the glass plates, especially the use of a weak solution of nitrate of silver immediately after the first coating of albumen; also the conjoint use of protiodide of iron and sulphate of iron upon albumenised glass plates; and also the simultaneous production upon glass plates of images which are both positive and negative according to the light in which they are viewed. (In the specification of a patent granted to Mssrs. Malone and Talbot, the 19th of December, 1849, a method is described of producing such images which differs from the present in the prior formation of the negative image which is afterwards converted into a positive one.) Also, the apparatus described to be used along with a camera, enabling the operator to work without the necessity of darkening the apartment in which he works, or of employing a tent or other contrivance for working in the shade when taking photographic pictures at a distance from any house. The form of the apparatus may be considerably varied, but the essential point is that the glass plate is placed in the cell in a partly prepared state, in which it is insensible to light, and is not removed from the cell until the photographic picture is finished, with the exception of the final washing and drying. The patentee does not claim as new the mere use of a glass cell containing nitrate of silver, into which the photographic plate is dropped previous to, or during the formation of the image; but he claims the addition of the stop-cock and waste-pipe, and the general arrangements which render unnecessary the removal of the plate from the cell before the picture is finished. He states, also, that he believes the arrangement of four

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vessels furnished with tubes and stop-cocks for pouring measured quantities of different fluids into the glass cell to be a new one.

The second part of the invention consists of a method of obtaining, under certain circumstances, the photographic picture of objects which are in rapid motion. An electric battery of the greatest power which can be conveniently obtained is arranged in a darkened room, and, supposing the moving body whose picture is required, is a wheel revolving upon its axis, the camera is placed at a convenient distance from it, and adjusted so as to have the image of the object in its focus. A glass plate is then taken, which has been previously prepared in the way described above, and it is rendered sensitive with nitrate of silver in the way also above described; it is then placed in the camera, and the electric battery is discharged, producing a sudden flash of light, which illuminates the object; the image thus taken on the glass plate is then rendered visible, and the process finished as before directed. If the process is properly conducted, a distinct positive image of the moving body will be seen upon the glass, the rapidity of the motion not affecting the accuracy of the delineation.

What is claimed under this head of the invention is the use of the instantaneous light of an electric battery in such a way as to obtain the photographic image of a body illuminated thereby. — *Mechanic's Magazine.*

NEW PHOTOGRAPHIC PROCESS.

BY MR. C. J. MULLER.

THE following photographic process has been communicated to us by Mr. C. J. Muller, from Patna, in the East Indies. We have submitted it to an experienced photographer; and he informs us that it offers many advantages over the Talbotype or the Catalissotype of Dr. Woods, which it somewhat resembles; that it is easy in all its manipulatory details, and certain in its results. We give Mr. Muller's own words :—

"A solution of hydriodate of iron is made in the proportion of eight or ten grains of iodide of iron to one ounce of water. This solution I prepare in the ordinary way with iodine, iron turnings, and water. The ordinary paper employed in photography is dressed on one side with a solution of nitrate of lead (15 grains of the salt to an ounce of water). When dry, this paper is iodised either by immersing it completely in the solution of the hydriodate of iron, or by floating the leaded surface on the solution. It is removed after the lapse of a minute or two, and lightly dried with blotting paper. This paper now contains iodide of lead and protonitrate of iron. While still moist, it is rendered sensitive by a solution of nitrate of silver (100 grains to the ounce), and placed in the camera. After an exposure of the duration generally required for Talbot's paper, it may be removed to a dark room. If the image is not already out, it will be found speedily to appear in great strength, and with beautiful sharpness, *without any further application.* The yellow tinge of the lights may be removed by a little hyposulphite of soda, though simple washing in water seems to be sufficient to fix the picture. The nitrate of lead may be omitted; and plain paper only treated with the solution of the hydriodate of iron, and acetic acid may be used with the nitrate of silver, which renders it more sensitive. The lead, however, imparts a peculiar calorific effect. The red tinge brought about by the lead may be changed to a black one by the use of a dilute solution of sulphate of iron—by which, indeed, the latent image may be very quickly developed. The papers, however, will not keep after being iodized."

Mr. Muller suggests that as iodide of lead is completely soluble in nitrate of silver, it might furnish a valuable photographic fluid, which could be applied at any moment when required.

No small degree of interest attaches to this process — originating in experiments carried on in central India. It appears perfectly applicable to the albuminised glass and collodion processes.—*Athenæum.*

SAN TORINO EARTH.

THERE is a cement now coming into general use here, which, if not already known in the United States, is worth being tried. It is called "San Torino Earth," and has been found to be the best *under-water* cement ever used in these parts. It is mostly used in the building of piers, moles, docks, &c. The island, where it is found, and from whence it takes its name, is situated in the Grecian Archipelago, latitude 36° 23′, and longitude 25° 26′. The name given to it by the Turks, appears to be "Kameni," or, "the Burnt Isle," and it is generally considered to be the remains of a volcano not yet entirely exhausted. The earth is exceedingly dry and appears to consist of silicate of iron and alumina, with a large proportion of a light, porous and fibrous substance, which floats upon

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the water, and is supposed to be "pumice." It has been very extensively used in Syria and in Algiers, in the building of fortifications, &c., where it has been found to answer admirably, and also here in Trieste, and at Venice and Fiume, with equal success. These works have been chiefly under water in the sea, in which the cement sets very hard in a comparatively short time. Trials, however, have been made *above water*, and exposed to the action of the air, which are said also to have answered very well. For use, the following composition has been prescribed for works *under water*; viz., 7 parts San Torino earth—2 parts lime, and 7 to 9 parts stone rubbish; and for works above water, 6 parts San Torino—2 parts lime, and 6 to 7 parts stone rubbish. The rubbish stone should consist of pieces not too small, and as rough and irregular as possible, thus binding better with the cement. Where economy is greatly desired, a portion of sand may be used instead of wholly San Torino earth, in proportion of 4 parts San Torino, 2 or 3 parts sand, 3 parts lime, and 6 parts stone rubbish. This is said to be just as good as the first-mentioned composition, though requiring longer time to harden. For use, the San Torino earth, sand, and lime, must be well mixed, and made, with the necessary quantities of water, into a very consistent mortar, then heaped together, and placed under roofing for two or three days. In the mean time the foundation should be made with loose stones thrown into the sea at the spot required, and the caisson or form sunk on this. Into this caisson are to be thrown alternate layers of the mortar and stones. To every 2 or 3 feet of mortar the same quantity of stone rubbish, and so on to the water's edge.

The price of this earth at the quarry is said to be from 8 to 10 carantani, per stago beneto, equal to about from 6 to 8 cents. per cwt. If desired by Government, I will order a barrel for trial from here.—Extract from a communication from the Consul of the United States at Trieste, published in the Report of the American Patent-office for 1850.

FORMULÆ FOR MARKING INK.

BY M. GUILLER.

THE various marking inks hitherto prepared (says M. Guiller) have but imperfectly answered the purpose for which they were intended.

Some have presented only yellow traces; others, which were blacker, partly, and sometimes entirely disappeared, after several washings.

Again, others required two distinct operations, which presented a host of inconveniences, which may be readily conceived, with regard to errors or possible forgetfulness, either as regards the care required or the time necessary for the operation.

Pursuant to these considerations, and to meet the wants of commerce and manufactures, hospitals, and civil and military administrations, we have endeavored to compound an ink which should have none of the inconveniences of those at present known, and which should present every facility and success in its application.

We shall here give several formulæ which represent so many improvements in the preparation of marking inks, which may readily be perceived from the difference of their various results.

Formu'a No. I.

	Grammes.
Nitrate of silver.....	11
Distilled water.....	85
Gum arabic in powder...	20
Subcarbonate of soda....	22
Liquid ammonia.....	20

Dissolve the 22 parts of subcarbonate of soda in the 85 parts of water; put the gum into a marble mortar, and gradually add the solution of bicarbonate of soda, stirring with the pestle to dissolve it.

Dissolve the 11 parts of nitrate of silver in the 20 parts of liquid ammonia.

Mix these two solutions together.

Put the whole into a matrass and apply heat. The matter, which was of a dirty grey, and half coagulated, becomes very clear and turns brown, when it has arrived at the boiling point, it becomes very deep and of a liquid consistence which enables it to flow from the pen.

This ink, made cold like the following, does not form any deposit, turns thick, as is seen by boiling, besides the deep color which it gives to the ink, disengages ammoniacal vapors which weaken the odor of ammonia which enters into its composition.

Formula No. II.

	Grammes.
Nitrate of silver.....	5
Water.....	12
Gum.....	5
Subcarbonate of soda....	7
Ammonia.....	10

Mix as in No. I.; put the whole into a matrass and evaporate until the liquor has

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acquired a very deep brown tint, which occurs when the liquor has lost about 5 per cent. of its bulk; further evaporation would cause a precipitate, on account of the vapors which would carry away principally too much ammonia.

The liquor is then excellent for marking, and the characters formed are black: it constitutes an ink especially suitable for stamping.

Formula No. III.

	Grammes.
Nitrate of silver.....	17
Water.....	85
Gum.....	20
Subcarbonate of soda...	22
Ammonia.....	42
Sulphate of copper.....	33

First dissolve the 22 parts of subcarbonate of soda in 25 parts of water, and the 17 parts of nitrate of silver in the 42 of ammonia.

This done, put the 20 parts of gum into a mortar with the remaining 60 parts of water, agitate with the pestle, and pour in the solution of subcarbonate; then put the whole into the solution of nitrate. Finally, add the 33 parts of the solution of sulphate of copper.

The greater quantity of ammonia is rendered necessary by the presence of the sulphate to be dissolved.

Again, a larger quantity of ammonia enters into its composition.

The sulphate of copper may also be replaced by nitrate of silver; but as the sulphate of copper is deepest, a greater quantity of nitrate than of sulphate would be required.

This composition differs from the others in having a blue tint instead of the deep brown one which those have which contain no solution of copper.

It may be conceived that all these relative qualities, given as formulæ intended for producing inks suitable for their employment, may be varied according as we want a more or less thick ink, according to the use to be made of it and the stuff to which it is to be applied, remarking always that if, on one hand, the presence of ammonia in these compositions acts as a solvent and enables us to form an ink for marking linen without previously applying a preparation, on the other hand, the evaporation of a portion of the ammonia by heat gives to the liquor a deep color which enables us to see the characters ultimately black.

Finally, the boiled liquor *greases* less, and thus penetrates more and spreads better on the linen without forming a beard.

As to the mode of using it, either with a pen or with a stamp, the ordinary application must be followed; that is to say, a hot iron must be passed over the characters traced, in order to make them penetrate into the stuff.—*Journal de Pharmacie*, November 1851.

ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.*

Improvements in the manufacture and refining of sugar. ROBERT OXLAND and JOHN OXLAND, both of Plymouth, chemists. Patent dated May 15, 1851.

This invention consists in the employment of phosphoric acid, in a combined state, for defecating and decolorising saccharine liquids or solutions of sugar.

The patentees do not confine themselves to any particular phosphates or superphosphates, nor to any stated proportions thereof, but they claim the employment of phosphoric acid in a combined state as described.

Improvements in the construction of dwelling-houses and other buildings, including floating vessels; and for the adaptation and manufacture of materials for such uses. GEORGE TATE, of Bawtry, York, gentleman. Patent dated May 22, 1851.

Claims.—1. The construction of dwelling-houses with staves or pieces of timber, or other suitable material, fitted together and bound by hoops or similar binders, whether the shells of such houses be constructed singly or jointly, one within another, leaving spaces between. The construction of floors, roofs, and partitions, by wedging up pieces of wood or other material in concentric rows, surrounded by an external hoop, binder, or fastener, and having the interstices filled with glue or other viscous and siccative matter. The construction of doors and window-frames with a collapsible fastening, and of doors and window-shutters with angle and strut supporters.

2. The construction of water-closets in such manner that the soil shall be withdrawn and choking prevented by apparatus adapted thereto and working therein. The construction of cesspools with staves or pieces of timber, combined and adapted to receive apparatus for mixing and removing the soil; and the construction of sewers, drains, and pipes for the conveyance of fluids by means of staves and pieces of timber, or other suitable material, combined and held together by hoops.

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3. The preserving of timber by means of carbonate of lime, carbonate of baryta, hydrated oxides of earths or metals, arsenites or arseniates, precipitated in the pores of the wood.

4. The construction of suspension bridges with chains made rigid by means of certain arrangements described; a peculiar construction of arch girders for bridges; and the construction of bridges with staves or pieces of timber, or other suitable material combined and bound together with hoops.

5. The adaptation of hollow divided columns for temporary purposes, and the construction of buildings.

6. The manufacture of bricks and tiles perforated transversely as well as longitudinally; the making of bricks, tiles, and pipes of clay by centrifugal action; the making of bricks, tiles, and slabs of brick-earth, moulded to the required form, and faced with clay of a finer description, or with porcelain, painted or otherwise ornamented, and glazed, and the adaptation thereof to the ornamental decoration of buildings and edifices; the manufacture of pieces of metal of suitable forms, glazed, colored, and enamelled, and the adaptation thereof to the ornamenting of buildings; and the adaptation of channels, flues, orifices, pipes, or diaphragms to buildings.

7. The construction of floating vessels with staves or pieces of timber or other suitable material, fitted and bound together; or with staves or pieces of corrugated metal similarly bound together with a combination of revolving buoyant supporters, or with a combination of air and water-tight compartments and buoyant revolving band supporters and rollers. Also the construction of floating vessels capable of being elongated or shortened at pleasure; and of life-boats with a combination of revolving compartments and buoyant band supporters or rollers.

Improvements in the carbonisation of coal, and in the utilisation of the products disengaged during that operation, in improving the quality of the products intended for illuminating purposes, and in regulating also the same. ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. (A communication.) Patent dated May 27, 1851.

The arrangements of apparatus specified under this patent are adapted to the manufacture of coke on a large scale, of a suitable quality to be used in locomotives, &c., at the same time that gas is produced for illuminating purposes, or for employment as fuel in the furnaces of the apparatus; they include also suitable means for regulating the delivery of the gas to consumers.

The distilling or carbonising chamber of the coking apparatus is placed on an inclination above the furnaces, the heat from which is caused to circulate around it by suitable flues, and the coal is supplied in large quantities from above by a tilt waggon. In the same incline, and forming as it were a continuation of the distilling chamber, is constructed a cooling chamber, into which the carbonised mass from the distilling chamber will descend by its own gravity when the two chambers are put in communication by raising the discharge cover of the one and the feeding cover of the other, which is done by means of a crane travelling on rails laid on the incline. The exterior of the cooling chamber is provided with cold-air channels or passages to facilitate the cooling of the carbonised coal introduced into it. The gas evolved during the carbonising process is conducted through a suitable pipe rising from the top of the distilling chamber to a hydraulic main, and in order to facilitate this part of the operation, an exhauster may, if desired, be connected with the chamber. When, however, the gas is to be employed for heating purposes, the pipe leading from the distilling chamber to the hydraulic main is lowered so as to dip into the water in the main, and thus prevent the exit of the gas from the chamber in that direction. The coke produced by this process is stated to be of great density, arising from the large quantities of coal operated on in mass, by which a general consolidation thereof is produced. The heat from the furnace of one apparatus, instead of passing off to waste, may be conducted through suitable flues to aid in the process of carbonisation in another apparatus.

The arrangements by which the supply of gas is regulated are adapted for application to mains or service pipes as may be required. The apparatus consists of a throttle-valve for regulating the area of the delivery-pipe, a float for giving motion to the machinery and actuated by the gas in its flow, an adjustable counter-weight for regulating the minimum pressure under which the gas is to flow, a weight for regulating the passage of the gas, and a metal casing inclosing the whole of the working parts, and forming one piece with the pipe through which the gas passes.

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Claims.—1. The arrangement of the distilling chamber or coke oven with or without a stationary cooling chamber, in combination with a furnace or furnaces and flues or channels for the distribution and transmission of caloric from one apparatus to another.

2. Constructing upon a curve the chamber in which the operation of distillation or carbonisation is effected, which curved chamber is placed at the degree of inclination most favorable to the feeding of the coal and discharge of the coke.

3. Arranging the cooling chamber in such manner that it may form a continuation of the distilling chamber.

4. The mechanical arrangments by which the coal is fed to the distilling chamber, together with those by which the distilling and cooling chambers are put in communication to allow the charge to pass from one chamber to the other when the coal has been converted to coke.

5. The arrangements which enable the coal to be operated on in such masses as to obtain coke of greater density than hitherto.

6. The railway and moveable crane placed upon the inclined plane for working the moveable covers of the distilling and cooling chambers.

7. The arrangements for collecting the gas evolved during the process of distilling to be applied to illuminating or heating purposes.

8. The peculiar construction and arrangement of regulator for regulating the flow and distribution of the gas to consumers; and particularly the use of an arm and progressive weight in such apparatus for regulating the pressure under which the gas is to flow.

Improved means of generating galvanic electricity, of decomposing water or various electrolytes, of collecting hydrogen, of burning it or atmospheric air, separately or in combination. HENRY W. ADAMS, of Boston, U.S. Patent dated May 29, 1851.

The first part of this invention consists in constructing galvanic batteries so as to obtain from a given weight of metal the greatest possible quantity of electricity, and to give it the highest degree of intensity.

The method adopted by the patentee in constructing his batteries to obtain these results is as follows:—He takes from thirty to fifty copper or other electro-negative metallic wires, of about one-sixtieth of an inch in diameter, lays them side by side, and insulates them in one bundle or package. He then takes a zinc cylinder about 8 inches long, 4 inches in diameter externally, and 3½ inches in diameter internally, about which he winds the electro-negative metal, in double coils, inside and outside, attaching one end of the coil metalacally to the zinc, but leaving a space of a quarter of an inch between the zinc and the coils, to be occupied by the water to be decomposed. The metals thus arranged constitute a single cell, having a great increase of aggregate surface of the electro-negative metal over the electro-positive metal, instead of the metals being arranged with equal, or nearly equal surfaces in each cell, as is the case in the single-cell batteries hitherto constructed.

In using these batteries for decomposing water or other liquid or electrolyte, the battery is immersed therein, and the liquid then forms a thin sheet, occupying the space between the coils and the zinc, by which means the full decomposing effect of the electricity can be obtained. When water is being decomposed, the oxygen of the water combines with the zinc, and forms an oxide of zinc, which should be held in solution by slightly acidulating the water with sulphuric acid; the hydrogen liberated at the same time may be collected and burned if so desired, or applied to other purposes. When the water becomes supersaturated with oxide it should be drawn off, and a fresh supply added. The patentee next proceeds to describe and claims an arrangement of apparatus for collecting the gas and supplying fresh acidulated water or other liquid, and for removing the used fluid from the battery.

Another method of decomposing water and obtaining hydrogen and oxide of zinc, consists in substituting heat for the acid, and retorts for negative metal for the battery. The retorts are charged with zinc or ores of zinc, and the water or steam is passed through them while in a heated state; or one retort may be charged with carbonaceous matter, and a second with zinc, and the water passed through each of them, successively, by which means hydrogen will be liberated and an oxide of zinc formed in the second retort. The gas produced is subsequently carbonised by passing it through a benzoling vessel, or it is passed through a retort containing decomposed oil, tar, resin, or carbonaceous matter, by which the gas is rendered permanent.

Another improvement consists in a method of increasing the heating power of hydrogen or other gas by passing it, pre-

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vious to combustion, through or in contact with charcoal or charred matter in a pulverised state.

Another part of this invention consists in the construction of a vessel for impregnating atmospheric air or gas with the vapor of volatile hydrocarbons such as benzole, alliole, acetone, pyroxylic spirit and other analogous burning fluids which are sufficiently volatile to carbonise air or gas at common temperatures. This vessel consists of a perfectly air-tight box, divided horizontally into compartments communicating each with the one next it, by means of pans supporting perforated shelves, on which are placed layers of sponge, cotton, wicking, or other suitable porous material. The top of the box is provided with a funnel for the introduction of the benzoling or other fluid, which is poured in in sufficient quantities to saturate the layers of sponge, and fill each of the pans; the bottom of the vessel is made double, the false bottom being perforated to admit of the superfluous fluid flowing out, and of the gas ascending to the compartments, each of which it traverses in succession, becoming impregnated during its passage, and finally passing off through an aperture at the top of the vessel to a gas or air-holder, or to the burners. By this arrangement, the air is exposed to a continuous surface of the benzoling fluid; and, in consequence, is thoroughly impregnated without the necessity of adopting means for raising the temperature of the fluids; and without the employment of mechanical pressure for forcing the air, as it readily ascends through these chambers of vapors.

Another improvement consists in the adaptation of burners suitable for the combustion of benzolised air. For this purpose the patentee enlarges the aperture of the burner, whether argand, fish-tail, or otherwise, to such an extent as to enable them to deliver a sufficient quantity of benzolised air to produce good light without resorting to extraordinary pressure, and he places over the burners platinum, palladium, or other analogous metallic cones, which by becoming heated to a white heat, when the air is ignited, produce a light of intense brilliancy.

Another part of the invention consists in constructing air-holders and suppliers. In one arrangement the body of the holder is composed of flexible material, with hoops to retain it in form; the air is supplied to the holder by a pair of bellows, and exhausted by compressing the holder by a weight or other suitable means. For producing a regular supply of air to the burners, the patentee employs a common gas-meter, open to the air, which he sets in rotation by a similar arrangement of gearing, and draws in the air through a pipe in connection with the holder, and forces it out to be supplied to the burner. In order to prevent unsteadiness in the light, he also employs a small holder between the burners and the air supplied.

Claims.—1. The construction of a battery with the electro-negative metal in any one cell thereof, arranged in a bundle of two or more thicknesses, presenting a considerably increased aggregate surface opposite the electro-positive metal, instead of nearly equal surfaces of one metal against the other, as batteries have been hitherto constructed; the greatest capacity of the battery being obtained when a given weight of the electro-negative metal presents the greatest aggregate surface within the smallest space opposite the electro-positive metal.

2. The insulation of either of the metals used in a battery for the purpose mentioned.

3. The construction of a galvanic battery so as to give to the quantity of electricity generated in a single cell the greatest possible intensity by presenting the greatest possible aggregate surface of the electro-negative metal opposite the electro-positive metal, in an insulated coil or coils; which, to give the greatest intensity should be of the smallest possible size that will conduct the quantity of the electric current without its melting the coils.

4. The use in a galvanic battery of the negative metal in the shape of a wire or wires, or sheet or plates, in single or double coils or packages within or around, or within and around the electro-positive metal, so as to present in the smallest space opposite the electro-positive metal the greatest possible amount of conducting surface.

5. The insulation of the metallic wires, or sheets, or filaments, or packages of metal in a battery, when wound in a coil or otherwise disposed, in order to generate and conduct the current in a circuit of coils, so as to give to the quantity of electricity in a single cell the greatest possible intensity, and also to give a magnetic power to the coils by virtue of the lateral force of the galvanic current flowing on an insulated surface.

6. The making of the electro-negative metal of a battery in the form of a coil, whether the electro-positive metal be of the same or any other form.

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7. The direct immersion of the battery in the water to be decomposed, and the dispensing with conducting wires leading from its opposite poles; the water being either hot or cold—thus completing the circuit, and increasing its effect on the liquid by contact with it.

8. The winding or disposing of the coils or metals so as to leave a thin sheet of water merely between the zinc or other oxydisable metal and the electro-negative metal, for the sake of causing the current to exert on the thin sheet of water its entire decomposing energy without being obstructed by too great a body of water.

9. The employment of the galvano-electric current to influence the chemical affinity of the oxygen of the water for the zinc or other oxydisable metal to combine more rapidly with the zinc or other metal, by the simultaneous exercise of both these powers, and thereby liberating the hydrogen with greater rapidity.

10. The use of this battery for producing motive power.

11. The removal of the oxydised water in batteries arranged and operated as aforesaid, to be converted into products of commercial value by any known chemical means.

12. The charging of retorts with zinc, or the ores of zinc, entirely or in combination with charcoal, coke, or other analogous carbonaceous material, when decomposing water and manufacturing oxide of zinc, as described.

13. The employment of charcoal, or other analogous carbonaceous material, to improve the heaty properties of hydrogen or other gas or mixture of gases.

14. The arrangement of a series of basins and perforated shelves, with the funnel and draw-off cocks, in combination with sponge, or other similar porous or absorbent materials, for the purpose of benzoling common air and other non-luminous gases with any of those hydrocarbons which are sufficiently volatile to enable air or non-luminous gases to burn with a clear white light when passed through chambers filled with their vapors at common temperatures, and at a distance from the benzoling reservoir.

15. The conversion of argand, fish-tail, bats-wing, and union-jet burners, where all the parts are immovable, into air-burners.

16. The use of any construction of platinum, palladium, or other analogous metallic cones, wicks, or conductors, to be placed in such contact with the flame produced by the burning of common air, imbued with the vapor of any volatile hydrocarbon, as to be heated to a white heat, and thereby to increase the intensity and brilliancy of the light.

17. The construction of air-holders and suppliers in manner set forth.

Improvements in the method of preventing and removing incrustation in steam-boilers and steam generators. JOHN ASHWORTH, of Bristol, Manager of the Great Western Cotton-works. Patent dated May 29, 1851.

These improvements consist in the employment of a certain compound of coal-tar, linseed-water, plumbago, or black-lead, and castile or other soap, for the purpose of preventing the formation on the interior of locomotive, marine, and other boilers of the insoluble incrustation caused by the deposition of lime or other impurities contained in solution in fresh water, or of the saline matters, such as sulphate of magnesia and chloride of sodium, with which sea-water is impregnated. The following proportions have been found by the patentee to answer well in practice:—33 gallons of coal-tar, 21 gallons of linseed-water, (prepared by boiling with the aid of steam, 14lbs. of linseed in water, and then straining to remove the seeds and other impurities), 5lbs. of plumbago or black-lead, and 8lbs. of castile soap (for which the common black or soft soap may be substituted, but not with so much advantage.) These ingredients, when intimately mixed together, form a composition of about the consistence of cream; of which, for a thirty-horse power-boiler, one gallon is introduced twice a week (the steam having been previously blown off) through the man-hole, or any other suitable aperture. The effect of the composition upon new boilers is to prevent permanent incrustation,—the impurities contained in the water forming a brilliant and thin coating on the interior surface of the boiler, which scales off and falls to the bottom of the boiler, from whence it can be swept out, or otherwise removed; while in the case of old incrusted boilers the deposit on the interior surface thereof soon becomes loosened and detached, and may then be easily removed by sweeping.

Claim.—The use of a mixture or composition of coal-tar, linseed-water, plumbago, or black-lead, and castile or other soap, for the purpose of preventing and removing incrustation in steam-boilers, but without restriction to the exact proportions of the ingredients named, or to the precise method of using the same above decribed.

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Improvements in the manufacture of iron. ISAAC HAZLEHURST, of Marton, Dalton, steel refiner. Patent dated June 3, 1851.

This invention consists of an improved method of operating upon pig iron in the puddling furnace, so as to obtain the metallic mass in a spongy state, and admit of its being ground or pulverised previous to undergoing the second puddling operation. The iron produced by this process is peculiarly adapted for the manufacture of spades, shovels, sickles, scythes, hooks, rivets, boiler-plate, sheet-iron, tin and block plates, wire, and other purposes where iron of a superior quality is required.

In working according to his improvements, the patentee introduces into the ordinary puddling furnace the usual charge of pig iron, or pig and refined iron, or pig iron with a mixture of iron ores and carbonaceous matters,—such as ground coal, coke, charcoal or sawdust; he then melts the iron, and brings it to as thin and liquid a state as possible for the purpose of clearing the metal, and conducting the process of puddling in the usual manner up to this point. He then lowers the damper until the iron begins to thicken, when it is again boiled and kept very hot, in order to bring it again to a thin and liquid state. The draught of the furnace should then be lowered, until the iron becomes malleable and is ready to "ball." The iron is then drawn out of the furnace in pieces of any required size, but without balling; and the lumps are placed in barrows or other receptacles, where they can be shut in and kept from the external air until cool. When cold, the lumps will be found to be of an open, spongy, and honeycomed texture, and must be ground or pulverised with rollers, or stampers, and the bad iron or crude, or imperfectly worked metal, dirt and other impurities, which would injure the quality of the iron, removed therefrom by picking and sorting. The manufacturer then takes sufficient of this ground iron to produce a bloom or bar of the size intended to be made, which is introduced into the same, or any other suitable furnace having a sand or cinder bottom, and balled at a low heat; after which, the metal is finished under the hammer, or in squeezers, or rolls of the ordinary description; as iron produced by this process requires no cutting or piling.

The iron thus manufactured will be found peculiarly applicable to the purposes above mentioned; but when it is to be polished after being made up, the ground iron should be scoured before being subjected to the second puddling operation. The ground iron may also be used for sinking in the charcoal fires, and for making iron to be converted into steel,—for which purpose charcoal pig iron, or best scrap iron, have hitherto been employed; and by this means, not only is a considerable economy in the cost of the iron effected, but iron of equally good quality produced.

In conclusion; the patentee observes that although he has in his description mentioned certain processes in the manufacture of iron, which are well known, he does not intend to claim the same, nor does he claim the employment of carbonaceous matters, as above mentioned; but what he does claim is—Stopping the puddling process at a certain point, so as to obtain the iron in a spongy or honeycombed state, and then grinding or pounding the same while in that state, so as to admit of the picking or sorting operation taking place, in order that previous to any subsequent working the crude iron, or dirt, or other impurties which would injure the quality of the iron, may be removed therefrom.

Improvements for increasing the produce of autumn wheat. FELIX CHARLES VICTOR LEON LEVACHER D'URCLE, of Paris, farmer. Patent dated June 12, 1851.

These improvements are based on a supposed discovery of the patentee's, that autumn wheat is, contrary to the generally received opinion, a biennial plant, and it is to develop its natural capabilities, and rescue the plant from the state of degeneracy to which a long course of improper management has reduced it, that is the object proposed to be attained by him. The ground in which the wheat is to be sown must be tilled and well manured, and the sowing is directed to take place between the 20th of April and the 10th of May; it may be a few days earlier or later, but somewhere between those dates is, the patentee says, the proper moment. The field having been divided into squares of about a quarter of an acre each, diagonal rows of holes are dug at a distance of from 15 to 20 inches apart, in each of which are deposited four grains of wheat arranged in a circle, or otherwise at a little distance from each other. This done, the holes are filled in, and when the plants have grown to a height of about 4 inches, three out of the four plants which are sup-

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posed to have sprung up from the seed, are to be pulled up, leaving one plant only, and that the strongest and most healthy, the produce of wheat from which, when it arrives at maturity, will be very considerably increased over the usual yield. By following out this course of treatment the quality of the grain will be increased each succeeding year until it arrives at a state of perfection, of which, under the ordinary system, it is supposed to be quite incapable.

Claim.—Developing the biennial properties of autumn wheat by the process described, by which its produce will be very much increased.

Improvements in obtaining soap from wash-waters. WILLIAM BIRKETT, of Bradford, agent. Patent dated June 12, 1851.

In carrying out these improvements soap-suds or wash-waters are subjected to evaporation (which may be done in any convenient vessel), until they are reduced to pasty or cream-like consistency; a quantity of common salt or other soluble salt is then added, and the addition of such salt is continued during the boiling, until the fatty matters of the soap in the wash-waters are separated from the water and salt to such an extent that (on being allowed to settle for a time) the fatty matters may be skimmed off. They are then removed to another pan, where caustic soda or potassa ley is added to them, and hard or soft soap produced according to the nature of the alkali employed. Or, the product of the evaporation is combined with fatty matters or resin, and converted into soap. The ley or refuse resulting from the above process is allowed to settle, and the clear liquor evaporated, so as again to be used in place of the salt solution, above described, for separating the remainder of the water from fresh quantities of soap-suds or wash-waters.

The patentee makes no specific claim, but states in conclusion, that the novelty of his invention consists in treating suds or wash-waters by evaporation, and separating the remainder of the water and refuse matters by a suitable soluble salt, and then employing alkali to convert such products again into soap.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS &c.

MEMOIR ON THE COMPARATIVE CHEMICAL ANALYSIS OF THE ROOTS OF RHATANY AND TORMENTILLA, THE LATTER BEING PRESENTED AS A SUBSTITUTE FOR THE FORMER; WITH A NOTE ON THE PREPARATION OF SYRUPS OF EXTRACTS.

BY M. DAUSE, SEN., PHARMACIEN, PARIS.

FOR some years past, the roots of rhatany sent to us from America have become very rare; those which are designated under the name of rhatany in fillets have completely failed; they alone furnish an extract rich in tannin, coloring matter, &c. The stumps, on the contrary, furnish two-thirds less extract; moreover, the stumps are very rare, and may also fail. However, the extract and the decoction of this substance are continually employed. I have sought among indigenous astringent vegetable substances for that which most nearly resembles this exotic root; and from many trials, having ascertained that the root of tormentilla approached nearest to it, I have analysed this root as well as that of rhatany, and the results obtained have convinced me that the preparations of tormentilla may completely replace those of rhatany. I have been desirous, besides, of preventing any substitution or adulteration, by designating the substance which might be used for adulterating the preparations of rhatany. The price of the extract of tormentilla being at least two-thirds lower than that of the extract of rhatany, this would be a great saving to patients who are not well off. I recommend this to the notice of physicians.

TREATMENT OF 25 GRAMMES OF FINE POWDER OF RHATANY, AND 25 GRAMMES OF FINE POWDER OF TORMENTILLA ROOT.

FIRST EXPERIMENT.

I first exhausted both of these substances with sulphuric ether.

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Rhatany.

The solution is deep red; taste astringent; it powerfully reddens litmus; it is precipitated by water, without coloring it. The precipitated matter floats on the surface if a few drops of ammonia be poured into the mixture; the substance precipitated from the ether is dissolved in the water: if a few drops of a solution of sulphate of iron be poured into the solution a black precipitate is obtained.

The ethereal solution of rhatany furnished by evaporation 4 gr. 50 per cent. of dry extracts which, when pulverised, was of a carmine red color.

Alcohol at 36° entirely dissolves this extract.

It dissolves in boiling simple syrup; but, by cooling, it becomes rather turbid; a little alcohol renders it clear.

Tormentilla.

Solution of a less deep red: it powerfully reddens litmus paper: its taste is almost as astringent: it is likewise precipitated by water. The precipitate floats on the surface, is redissolved by the addition of ammonia, and is abundantly precipitated by sulphate of iron.

The ethereal solution of tormentilla produced only 2·70 gr. per cent. of dry extract, which, when powdered, was of a pale rose color.

Alcohol at 36° entirely dissolves this extract.

It dissolves in boiling simple syrup; but, by cooling, it becomes rather turbid; a little alcohol renders it clear.

SECOND EXPERIMENT.

I treated the substance exhausted by ether with distilled water until it had no longer any color and taste.

Both aqueous solutions powerfully reddened litmus paper.

Rhatany.

The solution is of a very deep yellowish red color; but it is not limpid, which is owing to a little ethereal solution carried away and displaced by the water; the liquor is rendered clear by the addition of alcohol. This solution is precipitated by the salts of iron less than the ethereal solution.—Evaporated, it furnished 3·50 per cent. of dry extract, of a dull, deep brown: friable consistence.

Alcohol and simple syrup entirely dissolve this extract.

Tormentilla.

The aqueous solution of tormentilla is likewise turbid, yellowish red, rendered clear by alcohol, furnishes more precipitate with the salts of iron, gives 5·70 gr. per cent. of very astringent, sparingly friable, extract, which is very transparent when it is in bracteæ, of a light brown.

It dissolves entirely in alcohol and syrup, and the solutions are transparent.

THIRD EXPERIMENT.

25 grammes of powder exhausted by ether and water were dried, and then treated with alcohol at 36°.

Rhatany.

Until exhausted, the solution was still powerfully colored: it also formed a black precipitate with the salts of iron; its taste is slightly astringent.

Tormentilla

The solution is of less deep color than that of rhatany: it forms less precipitate with the salts of iron: it furnished only 50 hundredths of dry extract.

Both alcoholic solutions redden litmus paper. Evaporated, it furnished 3 grammes of dry and very friable extract, of a dull deep brown.

RECAPITULATION.

	gr.	c.		gr.	c.
Extract furnished by ether.....	4·	50	Extract furnished by ether.....	2·	70
Cold water..	3·	50	Water.....	5·	70
Alcohol at 36°	3·	0	Alcohol		50
Total....	11·	0	Total.....	8·	90

Difference in favor of rhatany 2·10gr.

FOURTH EXPERIMENT.

Rhatany.

25 gr. of new powder of rhatany exhausted by alcohol at 36°. Solution of a deep violet red, very limpid: this solution, diluted with a large quantity of water, did not become turbid, and formed an abundant black precipitate with the salts of iron: it furnished 11 gr. 60 c. of dry extract, of a deep red color, when in powder.

Water dissolved only a portion, and this must be the case; for, as is seen by the quantity of extract

Tormentilla.

25 grammes of new tormentilla exhausted by alcohol at 36°. Solution of a less deep red, not rendered turbid by the addition of water, forming rather less precipitate with salts of iron; it furnished 8 gr. 60 c. of dry extract, which, in powder, was of a fine, light red color, sparingly soluble in water, like that of rhatany.

This operation produced 30 centigrammes less than the first three experiments combined;—

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obtained, the alcohol at 36° had dissolved all which the same quantity of powder had furnished when treated successively by ether, water, and alcohol.

The additional 60 centigrammes of extract result from there being less loss in one operation than in three.

Boiling simple syrup dissolves it entirely; but it becomes slightly turbid on cooling.

A few drops of alcohol restore its transparency.

The turbidness arises from the matter which ether so readily dissolves, being insoluble in water, but not in alcohol.

perhaps I did not sufficiently exhaust it.

Boiling simple syrup dissolves it entirely; but it becomes slightly turbid on cooling.

A few drops of alcohol restore its transparency.

The turbidness arises from the matter which ether so readily dissolves, being insoluble in water, but not in alcohol.

Thus rhatany furnishes 3 grs. more than tormentilla, when treated by alcohol at 36°.

FIFTH EXPERIMENT.

Rhatany.

25 grammes of rhatany treated with alcohol at 21°.

Exhausted by this menstruum, furnished 9 gr. 10 c. of extract which, when pulverised, was of a fine, light, red color; it dissolved entirely in simple syrup; the solution was very limpid; it dissolved entirely in boiling water, and much less in cold water: when entire, it was brilliant, with a sharp and clear fracture, transparent when it is in thin plates, and of a garnet color.

Tormentilla.

25 grammes of tormentilla, treated with alcohol at 21°.

Furnished 11 gr. 20 c. of dry extract as fine as that yielded by rhatany, rather more soluble in cold water, equally soluble in boiling water and simple syrup, giving a very limpid syrup. It is evident that this menstruum furnished the most extract with this substance; its excess over that of rhatany amounted to 1 gr. 80 c.

Observation.—It is evident that the treatment by alcohol at 21°, or by hot water, is more favorable to tormentilla than to rhatany. The extracts obtained by these two menstrua are very rich both in tanning and coloring matters; dissolve well in simple syrup and boiling water, and a little fatty matter is found which dissolves in the ether or alcohol at 36°: the solutions also are less turbid in water. Thus, tormentilla furnishes, with alcohol at 21°, as much dry extract as the rhatany of the first, second, and third experiments united. We shall see further on the difference as to the tannin.

SIXTH EXPERIMENT.

Rhatany.

25 grammes of new rhatany of the stumps exhausted by boiling water, furnished 5·50 of dry extract. The decoction remained transparent so long as it was hot, but on cooling it deposited abundantly.

Extract of rhatany obtained from stumps and filets.

10 grs. were triturated with 200 grammes of cold water; the solution was incomplete; it was turbid; after filtering, I collected 2 grs. of extract which could not be dissolved in water, but it dissolved in water and simple syrup.

Tormentilla.

25 grammes of new tormentilla, exhausted with boiling water; it furnished 6·75 of extract. The decoction remained transparent so long as it was hot, but on cooling it deposited abundantly.

10 grs. of extract of tormentilla likewise treated with cold water, were not entirely dissolved. The residue weighed 3 grammes.

This residue dissolved in alcohol and simple syrup.

SEVENTH EXPERIMENT.

Rhatany.

Treatment of 25 grs. of powder of rhatany (stumps) by cold water.

I obtained 2·50 gr. of dry extract of a fine bright, red brown.

Taste very astringent; it entirely dissolved in cold water, when a very large quantity was employed.

Tormentilla.

Treatment of 25 grs. of tormentilla by cold water.

I obtained 5·50 gr. of extract of yellowish brown red color, of a rather less astringent taste.

Entirely soluble in cold water.

EIGHTH EXPERIMENT.

Rhatany.

I wished to ascertain the quanity of tannate of iron ob-

Tormentilla.

2 gr. of hydro-alcoholic extract of tormentilla, limpid

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tained by pouring the sulphate of iron into a solution of 2 gr. of hydro-alcoholic extract of rhatany: this quantity furnished 50 centigr. solution, treated by sulphate of iron, furnished only 40 centigrammes of tannate of iron or one-fifth less.

The extracts of astringent substances have one inconvenience which I must notice; they are very liable to become mouldy when they are in the soft, or even in the pilular state. Those of rhatany, tormentilla, bistorte, nut galls, &c. are in this case. Thus they must be kept only in the dry state: this is owing to their containing no hygrometric salt, and to their natural tendency to allow the small quantity of water which they contain to escape: this water, in evaporating, condenses on the cover of the vessel which contains it, and remaining on the surface of the extract causes the mouldiness.

The extract of roses of Provence, far from drying, when it is pilular, attracts moisture from the air, and liquifies; it also turns mouldy like the others.

It appears that all the substances which contain tannin present this phenomenon.

Another peculiarity of these extracts is, that even when they are obtained by the intermedium of cold water, although the solution has been perfectly limpid, the extract, immediately after evaporation, whether in the soft or in the dry state, dissolves with difficulty in cold water. For this there are several causes:—1. To dissolve it completely, it is necessary to treat it with a quantity of water equal to that used for extracting it (which has not been done when they have been employed in draughts): 2. Probably the heat and the air oxidise a part which becomes less soluble. The turbidness which results when these extracts are treated with water, can be attributed neither to albumen nor to resins.

Without heat, water cannot disssolve the resin which the ether manifested to us; albumen cannot exist with its physical properties in substances containing much tannin: it cannot be starch either, for water dissolves no starch without heat; nor can it be mucilage or gum, for alcohol added in any proportion to the aqueous solution made cold, precipitates nothing: it must therefore be attributed to their slight affinity for water.

If cold water cannot redissolve the whole of the extract which it served to prepare, simple syrup, without any intermedium, completely dissolves all these extracts, whether obtained with alcohol at 21°, with boiling water or with cold water, and the solution remains limpid, I have known this property of simple syrup ever since 1836. I have often pointed it out to many of my brethren, or to their pupils, when they have complained of the sparing solubility of extract of rhatany in water and draughts.

I owe this discovery to chance: I was called upon to deliver some syrup of rhatany immediately to a customer; on the same day I had finished a large quantity of the extract of that root; I conceived the idea of taking a very concentrated solution of this extract, equivalent to the quantity of extract which would enter into the syrup; I mixed the fluid extract with the simple syrup, and was agreeably surprised at its perfect limpidness.

Since then, I have always prepared this syrup, and, by analogy, all the other syrups which are made with extracts, not by dissolving these extracts in an equal weight of water, but in the syrup itself.

The following is the way in which I operated: the necessary quantity of simple syrup is weighed. Example: for syrup of rhatany, take 1 kilogramme of simple syrup and 32 grammes of dry extract of rhatany. The extract is powdered in a porcelain mortar; it is afterwards placed in a silver or porcelain pan, and about 250 grammes of syrup added; the powder is mixed with the syrup by means of a wooden spatula, then the pan is placed over the flame of a spirit lamp; it is stirred continually, removing the pan further from and bringing it nearer to the flame, so as not to heat too much, and until the syrup enters into ebullition: as soon as a little scum is formed on its surface, the whole is poured on a small cloth filter, freshly rinsed, and placed over a pan containing the rest of the simple syrup; it is stirred with a silver spoon in order to mix it thoroughly.

All this requires only a few minutes and costs nothing.

Why has sugar, in the state of syrup, the property of dissolving astringent syrups so perfectly? I think it may be attributed to the deoxidising property which it possesses. No doubt during the evaporation extract of rhatany and other extracts absorb oxygen which may be the cause of their being less soluble. The sugar, in combining with them, to form a syrup, deoxidises them and renders them more soluble.

Be it as it may, it is a positive fact that simple syrup dissolves these extracts very well; the quantity which it can dissolve without crystallising or losing its limpidness, is considerable.

I dissolved 10 gr. of extract of tormentilla or rhatany in 50 gr. of simple syrup without the medium of water, and as I indicated

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above; but it is preferable, in order to dissolve this quantity of extract, to employ 90 gr. of syrup; the syrup thus prepared contains 1 gr. of extract in 10 grs. of syrup, which is very useful for making draughts.

When physicians prescribe an astringent draught with one of these extracts, they should order a large quantity of sugar and very little distilled water, for too much water renders the mixture turbid, by precipitating a portion of the extract: a little alcohol (when not contra-indicated) clears the mixture.

When we have no concentrated syrup of rhatany, like that which I have mentioned, the best means to be employed for preparing a draught containing either extract of rhatany or extract of tormentilla, consists in powdering the extract, triturating it cold with the syrup, adding, if necessary, a few drops of alcohol, pouring this mixture into the phial, and adding afterwards distilled water and agitating well.

SUMMARY.

1. Ether demonstrates in rhatany and tormentilla a resinoïd substance, insoluble in water, but soluble in alcohol at 36°. It is to this substance in the extract that the turbidness of the solution in water must be attributed.

2. The rhatany selected and tormentilla root furnish most extract when they are treated with alcohol at 21°, or boiling water.

3. These substances furnish an entirely soluble extract if they be treated with only cold water; but by this means the whole of their astringent principle is not extracted.

4. The hydro-alcoholic extract of tormentilla, and that made with boiling water, contain at least one-fifth less tannin than the two corresponding extracts of rhatany: thus, to completely replace rhatany, it will be necessary to employ 5 grs. of extract of tormentilla instead of 4 grs. of rhatany.

5. Simple syrup and alcohol are the best solvents of these two extracts.

6. When it is wished to dissolve one of these extracts in syrup, it is unnecessary to use water; the solution is made much better with the aid of heat in simple syrup.

7. Whenever an aqueous solution is turbid, it may be rendered limpid by adding a certain quantity of alcohol.

8. Owing to the scarcity of rhatany, adulterators have set themselves to work; I have already seen two pretended extracts of rhatany made without rhatany. One sure means of cutting short all these adulterations, is to prescribe, instead of extract of rhatany, the extract of tormentilla, which, as its price is two-thirds of that of rhatany, will present no advantage to adulterators, and will enable pharmaceutists to furnish to patients in poor circumstances a less expensive medicament, which is as active as that made with rhatany.

9. The preparations of tormentilla are distinguished by a slight rose odor.—*Repertoire de Pharmacie*, November, 1851.

MEMOIR ON A NEW PROCESS OF PREPARING NITROUS ETHER, ON A PECULIAR SUBSTANCE WHICH GIVES IT ITS COLOR, AND ON A NEW CHEMICAL FACT RELATIVE TO THE NITRITES.

BY R. DE GROSOURDI, D.M.P. &c. &c.

THE process ordinarily used for preparing nitrous ether is that of M. Thenard; it consists, as all chemists know, in treating alcohol directly with the nitric acid of commerce. For this operation, the ordinary distillatory apparatus is employed, the receiver of which is surrounded by a refrigerant mixture, and whose tubulure is furnished with a safety tube communicating with three Woulfe's receivers, half filled with a saturated solution of chloride of sodium, and surrounded by a refrigerant mixture.

The capacity of the still should be equal at least to five times the bulk of the mixture of alcohol and nitric acid employed, and notwithstanding all the care which may be observed in heating the still, the mass increases so much in bulk, at a certain period, that the fire is always obliged to be suddenly withdrawn, and for the chief part of the time wet cloths have to be placed on the still head, so violent is the reaction: these various manœuvres are far from being without danger to the operator, as the retort may sometimes blow up.

The danger in which the operator is placed, is, doubtless, a very serious inconvenience; but, in my opinion, it is not the only one: indeed, by operating thus, only about one-fifth of the alcohol employed is converted into nitrous ether; since there is formed, at the same time as the nitrous ether, water, acetic, formic, and carbonic acids, and aldehyde; there are also formed binoxide and protoxide of nitrogen, and this body itself may be found in the free state, so intimate is the decomposition. Finally, a small quantity of undecomposed nitric acid passes into the receiver. The various bodies which I have mentioned result from the action between the alcohol and the nitric acid being much too rapid at a certain period of the operation.

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Throughout this molecular movement, a certain quantity of nitric acid is reduced to the state of nitrous acid, which, combining in the nascent state, with the hydric ether, gives nitrous ether, but in very small quantity, in proportion to the alcohol employed.

I consider that electricity performs the principal part in this reaction, at the moment when the various molecules enter into new combinations, neutralise their contrary electricities, and develop throughout an enormous quantity of heat which, by its presence causes all the danger of the experiment.

From the foregoing considerations, I have thought it necessary to seek for a process which, by avoiding the too violent action of nitric acid on alcohol, should not only render this operation free from danger, but also convert into nitric ether, if not all the alcohol employed, at least the greater part of it.

With this view, I made nitric acid act in the nascent state on alcohol, or rather on the hydric ether also in the nascent state; but this process not having succeeded to my entire satisfaction, I put nitrous acid in the nascent state in contact with hydric ether also in the nascent state, since the alcohol employed had been previously treated with concentrated sulphuric acid, by this means, I attained the object which I had proposed to myself.

I prepare nitrite of potassa by deflagrating in a Hessian crucible 100 parts of commercial nitrate of potassa, previously reduced to very fine powder and intimately mixed with 12·07 parts of lamp black, which may be regarded as almost pure carbon: when the deflagration is concluded, the crucible is covered, removed from the fire and allowed to cool; after cooling, it contains a very white and very hard mass; this is nitrite of potassa with traces of subcarbonate and subsilicate of the same base. These two salts will be in so much the smaller proportion as the mass has been less powerfully heated, and especially as the deflagration has been more rapid.

The following equation will explain the reaction: I omit the subcarbonate and subsilicate of potassa, as their presence is only accidental.

$$2C+NO^5,KO=NO^3,KO+C^2O^2.$$

Before entering into the details of this new process, I will here mention the following fact, which I think new.

Nitrate of potassa, pulverised and put into a test tube, with a sufficient quantity of alcohol, at 88·06 of the alcoholimeter, to form over it a layer of a few lines in thickness, no longer disengages nitrous acid, which is so easily recognised by its odor and color, when treated with sulphuric acid—a reaction which always takes place when this salt is treated with sulphuric acid, either with or without water, and which is a characteristic reaction of this kind of salt. It would be necessary, therefore, before employing the sulphuric acid, to drive off the alcohol.

The reaction of the nitrites, treated by sulphuric acid in presence of protosulphate of iron, is also modified by the presence of a certain quantity of alcohol in the liquors. Indeed, the brown coloration appears but slowly and forms an aureola round the crystals of the salt of iron, but it disappears immediately on agitating the liquid.

To prepare nitrous ether, I set in action in a glass retort 17·50 parts of alcohol of 85° of the alcoholimeter, 25 parts of nitrite of potassa, and 12 parts of sulphuric acid at 66° of commerce; and by acting thus, I convert into nitrous ether almost all the real alcohol employed, as is proved by the following equation:—

$$NO^3KO+SO^3,HO+C^4H^6O^2=SO^3,KO+NO^5,C^4H^5O+^2HO$$

MODUS FACIENDI.

The apparatus is composed of a tubulated retort, the tubulure of which is closed with a ground stopper: its capacity should be equal to about double the bulk of the mixture set in action; it is made to communicate with a tubulated receiver by means of two adopters, arranged end to end; to the tubulure is adapted, instead of the ordinary straight tube, a tube with two bends, the longest of which, should be at least 85 centimetres in length, dips it into a deep glass filled with mercury. This is, as will be seen, only the ordinary distillatory apparatus slightly modified.

Care must be taken that all the corks which unite the different pieces of this apparatus, should not only be hermetically sealed, but also that they should be tied round with string, and then covered with a layer of luting. The retort is placed in an empty water-bath, into which the water is introduced, only when it is necessary to raise the temperature; and the receiver is put into a vessel containing cold water, which is continually renewed, in such a manner as to be almost entirely covered; if it can be surrounded with ice or even with a refrigerant mixture, so much the better; but this is not indispensable, for very cold water has always answered the purpose with me. The apparatus, thus arranged, is suitably maintained and fixed by means of supports.

The object of the tube dipping in mercury is just to prevent the loss of a certain

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quantity of ether which, without this precaution, would make its way into the atmosphere; secondly, to produce pressure, and especially to facilitate condensation.

This done, I introduce into the retort nitrite of potassa in fine powder, then I add half the alcohol to be employed, and I mix the whole well with a whalebone stirrer; I then pour in, by small portions at a time, by means of a funnel, and taking care to agitate frequently, the sulphuric acid previously mixed with the other half of the alcohol, but after this mixture has become quite cold.

There are then disengaged only a few bubbles of carbonic acid, and no nitrous acid; the liquid remains perfectly colorless, and there is no apparent reaction, nor even any appreciable elevation of temperature.

The retort is then closed, and the whole is left to itself in the laboratory at the ordinary temperature, which should not exceed 50° F., when the experiment has been made and several times repeated. Care must be taken to agitate the mixture every seven or eight hours, in order to change the points of contact, and especially to facilitate the reaction.

At the end of eight hours' contact, when the retort is opened for the first time, the peculiar odor of the nitrous ether is already slightly appreciable; but at the end of twenty-four hours, when it is again opened for the purpose of stirring the mixture, a powerful odor of apples is perceived.

After 48 hours' contact, I pour into the bath water of the temperature of 86° F., and I maintain it at about that temperature; then the nitrous ether soon distils over and passes into the receiver.

The operation should be conducted very slowly, without raising the temperature of the water-bath beyond 95° F. When there is no more liquid in the retort, and the mass appears semisolid, I remove by means of a syphon all the liquid condensed in the receiver, then I pour into the retort sufficient water at 113°F., to cover the saline mass for about half an inch.

This done, I mix the whole well by means of the agitator; then I continue the distillation, raising the temperature of the sand-bath to 113 and 122°F., and by operating thus, I obtain in the receiver a further quantity of nitrous ether, but which is not quite so pure as that first obtained. The liquid remaining in the retort, and from which, by cooling, crystals of sulphate of potassa, are deposited, is yellow, and has a very powerful nitrous odor, partaking also of that of slightly rancid fatty matters. Its color and odor are due in great measure to the presence of a peculiar substance of which I shall presently say a few words.

From what I have just said, it is evident that, by this process the operator is exposed to no danger, since he is always able to govern the operation, which must be conducted slowly if he wishes to obtain a good product. As to the greater production of nitrous ether, this may easily be ascertained by weighing, after rectification, the ether obtained, and it will be found that it weighs more than two-thirds of the alcohol employed.

Thus obtained, the nitrous ether which has been removed from the receiver by means of a syphon, scarcely reddens litmus paper, and, most frequently, requires only a simple distillation at 68 or 71° F. at most, if the operation has been properly conducted, to be pure. Then, it does not redden litmus paper; it is perfectly colorless, and gives out a very sweet odor of apples.

When well purified, as I have said, nitrous ether does not redden litmus paper the moment it is dipped into it; but when once this paper is impregnated with it, it soon becomes red by exposure to the air, at first gradually, and afterwards more powerfully, and ultimately the same as with the powerful acids. This reaction is the result of the decomposition of nitrous ether under the influence of the oxygen of the air, which, doubtless, makes the nitrous ether pass to the state of nitric acid, by setting the hydric ether at liberty.

According to that, this body should be kept in well-stoppered flasks, so as to avoid all contact with the air. I think, besides, that the flasks which contain it should be of small size.

As to the ethereal liquid obtained after having added water to the retort, it is powerfully acid, and often of a yellowish color, especially if the temperature has been raised too high. To purify it, it must be treated in a stoppered flask with 1-10th of its weight of pure subcarbonate of potassa, in very fine powder, taking care to agitate the flask very frequently, so as to multiply the points of contact, and each time to allow the carbonic acid disengaged during the agitation to escape. After half an hour's contact, or more, if the liquid is still acid to litmus paper, it is distilled as I have directed above, which should be repeated several times, if necessary, we thus obtain a furthe quantity of perfectly pure nitrous ether. We should act in the same manner with the first ether obtained, if it is too acid. In all these cases, the flask should never be filled beyond two-thirds of its capacity.

Thus obtained, this ether is perfectly co-

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lorless, although authors assign to it a yellowish color; but when it is thus colored, it is not pure. Indeed, it holds in solution a peculiar substance, which I regard as a new hydro-carbon.

This body, isolated, is presented under the form of a reddish yellow oleaginous substance, having a peculiar odor resembling that of fatty matters left for a certain time to the action of damp air; it is an odor like that of rancidity mixed with something aromatic. This odor is so lasting that when this substance is touched with the fingers, they remain for a long time impregnated. This substance is very soluble in the ethers and in alcohol. Having only a very small quantity at my disposal, I have not been able to study it properly.

I procured this substance by treating with hydric ether the residue resulting from the spontaneous evaporation in the sun under a bell glass containing quick lime of the yellowish liquid which contained the crystals of sulphate of potassa, after the preparation of the nitrous ether; or else by treating in the same manner the residue of the purification of this same ether, when it was obtained colored owing to too great heat in its preparation; then, the ethereal liquid resulting from it, left to spontaneous evaporation, as I have already stated, with regard to the yellow liquid from which the sulphate of potassa is deposited, left this body in the pure state at the bottom of the capsule, the ether being entirely disengaged.

I had at first prepared nitrous ether by employing commercial nitrate of potassa instead of the nitrite, and acting in other respects, exactly as I have indicated above, and operating with the same apparatus. This process gives a very good product, but in much smaller proportion than the above process, to which, consquently, I give the preference. Besides, a greater quantity of hydrocarbon is formed, which almost always gives the ether a yellowish color, and the product of which is rather more acid; but after proper purification, the nitrous ether obtained is very good.

This is a very good process, and I consider it preferable to that of M. Thenard, inasmuch as it is free from danger and furnishes a larger quantity of purer ether. It may therefore be employed when nitrite of potassa cannot be obtained, or when we cannot take the trouble of preparing it.

The proportions to be employed for preparing nitrous ether by this process are the following:—

	Parts.
Nitrate of potassa.....	57·48
Commercial sulphuric acid at 66°..	25·89
Alcohol at 86° of the alcoholimeter	116·

THEORY OF THE REACTION.

$$2C^4H^6O^2 \left\{ \begin{array}{l} C^4H^6O^2 = \left\{ \begin{array}{ll} HO & \\ C^4H^5O = & \left\{ \begin{array}{ll} C^4H^4 = & C^5H^5 \\ & C \\ & H \\ HO = & HO \end{array} \right. \end{array} \right. \\ C^4H^6O^2 = \left\{ \begin{array}{l} HO \\ C^4H^5O \end{array} \right. \end{array} \right. \qquad NO^5KO = \left\{ \begin{array}{ll} NO^5 = & \left\{ \begin{array}{l} NO^3 \\ O \\ O \end{array} \right. \\ & \\ KO & \end{array} \right. \quad ..=CO$$

$$=NO^5, C^4H^5O. \qquad SO^3,HO = \left\{ \begin{array}{l} SO^3 \\ HO \end{array} \right. \qquad ..=SO^3,KO$$

The following is the equation of the foregoing theory:—

$$2C^4H^6O^2 + NO^5,KO + SO^3,HO = SO^3,KO + NO^3,C^4H^5O + 5HO + C^3H^3 + CO.$$

From this it is easy to see that the reaction is much more complicated than in the former process; indeed, an equivalent of alcohol is lost to the etherisation, since, under the influence of the nitric acid, in being converted into nitrous acid, it is reduced into water, carbonic acid, and the hydrocarbon which constitutes the oleaginous substance which I have mentioned.

MODE OF OPERATING BY THIS PROCESS.

After having mixed together, and with the proper precautions as to the elevation of temperature, the alcohol and sulphuric acid, the mixture is poured, after complete cooling, into the tubulated retort, the apparatus having been previously arranged, as I have said above. This done, the nitrate of potassa in fine powder is introduced into the salts in small quantities at a time; care is taken, at the same time, to agitate the mixture well with the whalebone agitator, in order to multiply the points of contact; the still is then closed, and the whole is left to itself for three days in the laboratory, the temperature of which should be only 59° F.; the mixture is then carefully agitated every seven or eight hours, in order to facilitate the reaction by changing and multiplying the points of contact.

At the moment when the nitrate of potassa is put into the mixture of alcohol

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and sulphuric acid, there is neither elevation of temperature nor any apparent reaction; but when the mixture is agitated for the first time, at the end of seven hours' contact, a slight odor of nitrous ether is perceived, which becomes more and more powerful, so that at the end of 48 hours, it is perceptible all over the laboratory when the retort is opened. At this moment, by the agitation occasioned in the mass by this operation, a multitude of small bubbles of carbonic acid are disengaged, so that the mass appears to be effervescent; this phenomenon was also apparent at the end of 24 hours' contact, but in a much less degree. Then the liquor containing the saline mass is colored yellowish.

At the end of from 60 to 72 hours' contact, water of the temperature of 77 to 86° F. is put into the bath, which is maintained at this temperature, and nitrous ether is soon seen to distil over into the receiver into which some has already condensed. The operation should be very slowly conducted in order to obtain a good product. Towards the end of the experiment, that is to say when the greater part of the liquid contained in the retort has passed into the receiver, the temperature of the bath may be raised to 122° F., but the liquid condensed in the receiver must be removed.

The operation being completed, that is to say, when no more nitrous ether comes over, we proceed to purification and rectification, as I have already pointed out in speaking of the same operation, for nitrous ether obtained by means of nitrite of potassa.

During the whole time that these operations are being performed, the bulk of the mixture is not sensibly augmented; consequently, the operator is not exposed to any danger, and has the greatest facility in conducting the operation, which, for the chief part of the time, does not even require his presence.

All the nitrates may also be employed for this operation; but I have given the preference to that of potassa, as being the most economical and abundant in commerce. As to the nitrites, they may all be substituted for that of potassa, but those which have only a feeble affinity for each other, would ill fulfil the object. I think that preference should always be given to that of potassa, because, being, if not the most stable, one of the most stable, it will always be prepared with facility and economy.—*Journal de Chimie Médicale*, December, 1851.

A SIMPLE PROCESS FOR PRECIPITATING THE COTTON CONTAINED IN COLLODION.

BY THOMAS CATTELL, M.D., M.R.C.S. ENG. &c., BRAUNSTON.

A SHORT time since, I ascertained that on mixing bisulphuret of carbon with collodion, an immediate precipitation or separation of the cotton takes place, leaving a limpid fluid consisting only of the solvent and precipitant.

The cotton presents the same fibrous appearance as though it had not been in a previous state of solution, and as gun-cotton would do if simply immersed in water. When dried (as much moisture as possible being first pressed out between folds of linen or bibulous paper) it cannot be distinguished from the dried pulp of the paper-maker.

This singular reaction of the bisulphuret on the collodion, would lead to the supposition that the gun-cotton performs the part of a base to the oxide of ethyl (ether), for this substance is at once deprived of the peculiar properties which it possessed previous to solution.

It may serve also to explain more clearly the chemical composition of gun-cotton, or lignine, as acted on by nitric, or nitrico-sulphuric acid.—*Lancet.*

Braunston, Northamptonshire, 1851.

OBSERVATIONS ON THE SASSY BARK OF WESTERN AFRICA, AND ON THE TREE PRODUCING IT.

BY WILLIAM PROCTER, JUN.

VARIOUS travellers, from the celebrated Mungo Park to the more recent explorers of Western and Central Africa, have alluded in their narratives to the use of a poisonous bark as an ordeal to which persons suspected of witchcraft, secret murder, and other crimes in the code of those countries, are subjected, as a test of their innocence or guilt. In Congo, it is known as the "ordeal bark," and in Ashantee and the neighbouring settlements of Liberia, as "doom bark," and the process of its administration, as "taking doom." It is also said to be resorted to as a means of gratifying private revenge, an application to which its chemical nature readily admits, and its use, in the opinion of the missionaries, is a great moral evil worthy the attention of the philanthropic.

Moses Sheppard, Esq., of Baltimore—a gentleman whose interest in the welfare of the African race has, for many years past, connected him, as a patron, with the Co-

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lonisation of Western Africa, at Liberia—several years since received from Dr. Samuel F. McGill, of Cape Palmas, a few pounds of *sassy* bark; a portion of which was given to Mr. Charles A. Santos, now of Norfolk Va., who published an account of its physical, and some of its chemical properties, in this Journal, vol. xxi. p. 97.

More recently, Mr. Sheppard placed in my hands about two pounds of the bark for examination, but feeling a reluctance to devote time and labour to the investigation of a product, the botanical source of which was unknown, that gentleman kindly offered to obtain for me, through his friend Dr. McGill, specimens of the leaves, flowers, and fruit of the sassy tree. About nine months ago, a box was received from Liberia, containing the leaves, fruit, twigs, wood and bark of the sassy tree, but the flowers, the most important part, were omitted, as the tree was then in fruit. As the flowers then promised have not yet arrived, I have concluded to publish what facts have been collected from travellers, together with those derived from an examination of the specimens.

The tree producing sassy bark has not been described in any of the botanical works in the library of the Academy of Natural Sciences of Philadelphia, including De Candolle, Lindley, and Endlicher, and in the narratives of travellers so little attention has been given to the means of identifying it, that the specimens themselves, imperfect as they are in the absence of the flowers, will afford more light than can be obtained from any other available source.

In Bounditch's Ashantee, page 279, the following paragraph is found:

"Taking doom is the infallible test, when they consider the case too doubtful for human decision. The bark of that tree (viz. the "doom plant,") is put into a large calabash with water, so as to make a strong infusion; it is stirred up, while the suspected parties sip in turn. It operates instantly and convulsively as a most violent emetic and purge. Those who sip first may recover, and the dregs are frequently left designedly for the obnoxious."

In Tuckey's narrative of a voyage to the river Congo, page 185: "This morning Gangam Kissey (the public accuser and executioner) returned, and we learned that he had denounced three men of another village as the poisoners of the man that died, and the accused were immediately to undergo the ordeal of chewing the poisonous bark, which, if they were guilty, they would retain in the stomach, and this would occasion death, but if innocent, they would vomit."

Ibid. page 200.—"It appears that the bark used in the ordeal is from a species of Cassia."

Ibid. page 329.—"The bark and leaves of the Cassa tree, which Gangam Kissey made use of as an ordeal, were brought to us. They are said to be poisonous."

Bruce, in his travels, (vol. v. p. 27, quarto edition,) describes a tree called "sassa," which yields the *sassa gum* of African commerce, and he gives two figures which represent the leaves and flowers. The tree is very analogous in general appearance to that of the sassy bark, flowering in a terminal raceme, with bipinnate leaves, the foliols of which, however, are opposite, whilst those of the sassy are alternate. This tree is the Inga Sassa of Willdenow. (De Candolle.)

In the Appendix to Tuckey's voyage, &c., it is stated that "One of the unpublished genera is Erythrophleum the *red-water tree* of Sierra Leone, *another species of which is the ordeal plant or cassa* of the natives of Congo." This remark is more to the point than any that has been found; because, as Sierra Leone is near the locality whence the sassy bark is derived, and as there is strong reason for believing the cassa bark of Congo (why not *sassa* or *sassy* as a derivation or corruption?) and sassy bark to be identical, the former of which is attributed to a leguminous tree, said to be a species of Erythrophleum, (vid. ante) is it not reasonable to refer the sassy bark tree of Cape Palmas to the same genus, or at least to one nearly allied, and perhaps not yet described?

Lindley, in his last edition of the "Vegetable Kingdom," has placed the genus Erythophleum of Afzelius in the Natural Order FABACÆ, Sub-order, MIMOSEÆ, and tribe PARKIEÆ.

Endlicher, Genera Plant, page 1323, characterises the genus Erythrophleum of Afzelius thus:—"*Flores* hermaphroditi, regulares. *Calyx* quinquefidus subimbricatus. *Corollæ* petala 5. *Stamina* perigyna. *Legumen* compressum, bivalve, polyspermum. Arbor, Africæ tropicæ, excelsa; foliis bipinnatis, foliolis oppositis; racemis terminalibus et lateralibus." This agrees with the specimens of sassy, as far as they go, except in the position of the folioles, which will now be described.

The sassy bark is produced by a large tree with spreading branches. In the general appearance of fructification and foliage it resembles the Gymnocladus of the

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United States. The leaves are bipinnate, the pinnæ are articulated oppositely on the general petiole, and vary from three to six or seven on a side, according as they are taken from near the terminus of a branch or below; in the last case they are larger, and generally the pinnæ nearest the apex are largest. The folioles are subpetiolate, obliquely ovate, and acuminate, from one to three inches long and from one to one and a half wide, alternate, smooth, entire, sometimes slightly repand, and varying from three to five or six on a side, one being terminal. The bark of the younger branches and twigs, which is dark grey, is covered with light colored dots, which extend to the receptacles on the raceme.

The legume is from two to four inches long, and from one to two wide, violin shaped, of a dark chestnut color, coriaceous, compressed, obtuse at both ends, bivalved, containing from two to five seeds attached by short funiculi, and dehisces by the dorsal suture. The legume contains considerable tannin. The seeds have an oblong oval, flattened form, are black except the hilum, which is brown, smooth, and covered with a dry gummy transparent substance, analogous to cerasin, which is dissolved by boiling water, and forms a colorless solution, from which it is precipitated by subacetate of lead, sesquichloride of iron and alcohol.

The seed has a hard, horny episperm, and a tough, horny, light grey albumen, nearly surrounding the cotyledons, and composed of a bassorin-like substance, which swells in boiling water, and becomes translucent like tragacanth. The cotyledons are large, compressed, indurated, and yellowish green colored. They have a disagreeable taste, contain chlorophylle and fixed oil, in small quantity, but no starch, nor has this principle been found in any part of the plant.

The tree must be large, as the section of a branch three inches in diameter exhibited the bark but one-sixteenth of an inch thick, grey-colored, while the bark used for poisoning is from three to five-eighths of an inch thick. The young wood has a greyish white color, and is not very dense.

Sassy bark is taken from the trunk and larger branches. The specimens last sent by Dr. McGill are from a younger tree than those first received. The former was in pieces from four to ten inches long, all more or less curved, and exhibiting the mark of the knife at the ends, with some indication of dried sap on the cut surface, and about four lines thick. The exterior is slightly fissured longitudinally, and has lichenoïd matter attached. The older bark has the epidermis removed in most of the pieces, and has a dark brown ferruginous color. The internal construction of the bark is quite peculiar. A smooth transverse section exhibits numerous round, fawn-colored spots, surrounded by a reddish-brown cellular tissue. These spots are sections of cylindrical bodies, varying from one-half to two lines long, compact, brittle and very dense, sinking rapidly in water, and are most numerous in the oldest bark and near the inner surface. The specific gravity of the bark in mass, according to Santos, is 1·054. Sassy bark has a slight not very marked odor, and an astringent taste, without bitterness. This astringency, which is due to tannic acid, resides exclusively in the reddish colored portion, a fact easily shown by applying with a camel's hair brush a dilute solution of sesquichloride of iron to a transverse section. The fawn-colored spots will remain intact while the surrounding tissue is dyed deep black. Sassy bark breaks with an abrupt fracture, and is readily disintegrated. The dust, when inhaled by the nose in the act of powdering, causes long-continued spasms of sneezing, accompanied with distress about the forehead and eyes.

Chemical Examination of Sassy Bark.—It is stated in the works of systematic botanists that the secretion of tannin and gum is a marked feature of that portion of the Leguminosæ included in the sub-order Mimoseæ, of which the Acacias may be quoted as an example. The intermediate sub-order Cæsalpineœ is also largely characterised by species abounding in tannin, of which the Hæmatoxylan may be instanced. The sassy bark tree is largely tanniniferous, and the bark might be used for tanning purposes in its native country. Gum does not exist largely in the bark, but, as has been said, is found in and around the seed; and as it is probable that the gum-bearing character of the Acacias may be due more to disease, or to an interruption of the normal condition of the circulation of the trees by punctures or incisions, than to an overflow or superabundance of that principle; the comparative absence of gum from sassy bark is no reason why it should not rank in that sub-order.

A thousand grains of the bark, in powder, moistened with water, was put into a glass percolator, and about half a pint of strong infusion obtained by pouring water slowly on the bark. This was set aside, and the additions of water continued during two days, until the fluid passed tasteless and

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colorless. The residue dried at the temperature 90°—100° F., weighed 840 grains.

The clear infusion had a dark red color, and was not coagulated by heat. Sesquichloride of iron caused a flocculent precipitate of a greyish black color. Neutral acetate of lead, protochloride of tin, bichloride of mercury, and sulphuric acid, produce copious precipitates, and a solution of gelatine, affords a flocculent deposit. These tests indicate *tannic acid* in abundance, but its reaction with the persalts of iron and tartar emetic, the latter causing only a slight opalescence, indicate one of the modified forms of that acid.

When the tannin was removed from the infusion by gelatine in excess, and the liquid filtered, sesquichloride of iron caused a black coloration, which disappeared by heat. When the infusion was treated with a solution of neutral acetate of lead to remove the tannin and coloring matter, the filtered liquid afforded but a slight precipitate with subacetate of lead, indicative of but little soluble gum.

The residue of the sassy bark, after exhaustion with cold water, was boiled in water, and the transparent decoction filtered hot. As it cooled, a deposition of brownish red apotheme occurred, which was soluble in diluted alcohol and alkaline solutions, had but little taste, and that slightly astringent, due perhaps to a little unaltered tannin adhering, as it was colored blackish brown by sesquichloride of iron. This altered tannin exists in considerable quantity, as will be shown in a following experiment.

The cold decoction was not colored blue by solution of iodine.

The dried residue of the sassy was then exhausted with cold alcohol by displacement, yelding a dark kino-colored tincture, from which water precipitated a reddish-brown substance. This tinctnre was evaporated to dryness, the residue reduced to powder, and a portion exhausted by chloroform, which left a brown residue soluble in alkaline liquids and diluted alcohol. The chloroform solution by evaporation deposited a mixture of fatty matter and resin both in small quantity.

500 grains of the bark in powder was displaced with commercial ether, so as to obtain six fluid ounces, and the tincture evaporated to dryness spontaneously. This extract, which had a deep red color, was nearly all soluble in alcohol ·835. It was treated with cold water, which softened it, dissolved out the tannin, and acquired a reddish color. The extract was malaxated with repeated quantities of water until it ceased to lose weight. The residue was boiled in repeated portions of water till it was exhausted by that menstruum. The residue was soft and fusible at 212° F., had little odor, and burnt with a sutty flame, with a large carbonaceous residue. This was then treated with chloroform by trituration and thrown on a close filter; the larger part was dissolved, forming a light brown solution, which yielded a soft, brownish matter by evaporation. This substance, fused by a gentle heat, caused a greasy stain on heated paper, and was dissolved by warm solution of potassa, from which muriatic acid precipitated it in minute brownish globules, and is a mixture of resin and fatty matter. The undissolved portion left on the filter was apotheme, dissolved by the alcoholic ether first used. It was a brownish red powder, soluble in alcohol, insoluble in anhydrous ether and cold water, but dissolved partially by boiling water, and by solution of potassa, and swells up without disposition to inflame when heated.

The residue of bark left by the ether was extracted with alcohol, and this evaporated to dryness. This extract was exhausted with water and dried. The residue was completely insoluble in chloroform, swelled up when heated, was partly soluble in boiling water, very soluble in diluted alcohol and in alkaline solutions, and consisted almost wholly of a substance allied to the apotheme of Krameria triandra.

3500 grains of sassy bark in coarse powder was exhausted by alcohol, ·835, by maceration and percolation, and the tincture evaporated on a water-bath to a soft extract weighing 950 grains, which was used as the basis of a series of experiments for the active principle.

200 grains of alcoholic extract of sassy was triturated with 120 grains of calcined magnesia, and sufficient water to effect the combination of the tannin and coloring matter with that earth, and then dried at 212°. The mass, reduced to powder, was exhausted by boiling alcohol, and the liquid evaporated to half an ounce and set aside. As the liquid disappeared by spontaneous evaporation, an oil-like matter separated on the sides and the surface.

200 grains of the same extract was treated in the same manner with 200 grains of lime, previously hydrated. As the alcoholic liquid evaporated, the same oily looking matter was eliminated.

200 grains of the extract was treated with 100 grains of hydrated protoxide of lead (carefully freed from alkali by washing) in the same manner and on evaporating the

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alcoholic liquid the same product was obtained.

This substance is very soluble in alcohol, soluble in ether and chloroform, and but slightly soluble in water. Its alcoholic solution slowly restores the color of reddened litmus, but when heated with very dilute hydrochloric acid, it was not dissolved. Its solution in boiling water afforded a curdy precipitate with tannic acid. When heated to redness on glass or platina, a minute ash of white color remains, which is alkaline in its action on moist reddened litmus. It has little if any odor or taste, and a grain of it given to a cat, produced no poisonous effect, and consequently it is not the active principle. An analogous experiment of Mr. Santos (*Am. Jour. Pharm.* vol. xxi. p. 100,) yielded him "a few grains of a crystalline matter, having a white color and nauseating taste," which the paragraph following states was poisonous when tried on animals.

200 grains of the same alcoholic extract was triturated with half a pint of water, filtered, and the clear reddish brown solution filtered and refiltered through a layer of purified animal charcoal, previously boiled in alcohol. The charcoal was washed, dried, treated with boiling alcohol and this evaporated. A reddish brown amorphous residue was left without any indications of crystals, as obtained by Mr. Santos when a weak tincture was thus treated.

5000 grains of the bark in powder was exhausted with cold water by maceration and displacement, the colored astringent infusion precipitated with subacetate of lead, and the excess of lead removed from the colorless liquid by sulphuric acid carefully added. The filtered liquid was evaporated on a water bath; before acquiring a syrupy consistence tufts of crystals separated, which were removed and set aside. The evaporation was continued and the residue treated with boiling alcohol, which on evaporation yielded a brownish, syrupy, deliquescent substance, exhibiting no disposition to crystallise. A portion of this given to a cat produced no symptoms of poisoning.

The crystalline matter which consists of sulphate of lime and an organic salt of lime, has not been sufficiently examined.

From the foregoing observations it is apparent that neither of the substances described is the active principle. I am convinced that when isolated it will be found to possess great activity, as three grains of the aqueous extract of sassy given to a cat, caused violent poisonous symptoms, great prostration, frothing at the mouth, moaning, dilitation of the pupils, and total indisposition for food. Another series of experiments are now in course, the results of which will be tested physiologically; but as they cannot be concluded in time for this essay, they will, if successful, form the subject of a future communication.

The organic substances detected are tannin, an insoluble apotheme analagous to those in Krameria, and a combination of these, which constitutes the red coloring matter of the bark, gallic acid, gum, resin in small quantity, fatty matter, and a peculiar matter precipitable by tannin, and soluble in alcohol and chloroform, but which is not the active principle.

Inorganic constituents of Sassy bark.—2000 grains of the bark in small fragments, was charred and partially incinerated in an earthen crucible, and the incineration afterwards completed in a platina crucible, using a green glass rod to the contents occasionally. Sixty grains, or three per cent. of a light colored grey ashes resulted.

The ashes were treated with boiling distilled water in successive portions till exhausted; the filtered lixivium, which was alkaline to test paper, yielded by evaporation 3·6 grains of a white amorphous residue. This was dissolved in water, neutralised with nitric acid, which caused effervescence, and filtered.

The clear solution afforded no precipitate with ammonia, potassa, or their carbonates, oxalate of ammonia, ferrocyanuret of potassium, hydrosulphuret of ammonia, or with phosphate of soda and ammonia.

When a portion of the solution was evaporated, it yielded crystals of nitrate of potassa. A solution of tartaric acid caused the gradual production of a white crystalline precipitate of bitartrate of potassa, and bichloride of platinum a yellow one in octrohedons.

Nitrate of silver threw down a white precipitate, soluble in ammonia, and nitrate of baryta a white dense one insoluble in nitric acid.

The soluble portion of the ashes therefore contains, *carbonate and sulphate of potassa and chloride of potassium*, without lime, magnesia or iron associated.

The portion of the ashes insoluble in water, was treated with diluted muriatic acid, which dissolved nearly all with violent effervescence, and then evaporated to dryness. The dry mass was treated with boiling distilled water thrown on a filter, the greenish grey residue washed with distilled water, and the washings added to the first liquid, which was perfectly colorless. This was divided into two parts and one set aside.

This solution when much diluted, was not

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precipitated by caustic ammonia or potassa, but when not diluted, these reagents and their carbonates produced abundant white precipitates. Phosphate of soda caused a bulky white precipitate, soluble in muriatic acid. Oxalic acid and oxalate of ammonia each produced white granular precipitates soluble in nitric acid. Sulphuric acid caused no precipitate in the dilute solution, but an abundant crystalline one when stronger. All the tests indicate lime in abundance.

When the lime was separated by muriate and carbonate of ammonia, the filtered solution yielded no precipitate with phosphate of soda and ammonia. Chloride of barium caused no change. Hydrosulphuret of ammonia produced a slight black precipitate and ferrocyanuret of potassium, after standing a while, caused a slight white deposit, but no evidence of iron.

The reserved half of the solution obtained from the ashes, was then treated with an excess of solution of oxalic acid, and after the deposition of oxalate of lime ceased it was collected, washed, dried, and ignited at a dull red heat, and the resulting carbonate of lime was found to weigh 21 grains, equal to 42 grains from the whole of the bark treated, or about two per cent. It is probable that the greater part of the lime exists in the bark in combination with a vegetable acid as the ashes, which were obtained by gradual incineration, at a comparatively low temperature, contained the lime as carbonate. A portion of the lime probably exists as phosphate.

The portion of the ashes left on the filter after treatment with diluted muriatic acid and distilled water, was heated with strong muriatic acid, which dissolved all but a little silica and grit, and acquired a greenish yellow color. This solution, when diluted, gave evidence of iron by ferrocyanuret of potassium. It was then boiled with acetate of soda and acetic acid, and the gelatinous precipitate of the phosphate of iron dissolved in muriatic acid and heated with an excess of potash, by which the iron, as sesquioxide, was precipitated. The liquid left afforded no precipitate of alumina with an excess of acetic acid.

The insoluble portion of ashes consists chiefly of carbonate and phosphate of lime, phosphate of iron and silica, without magnesia or alumina.—*American Journal of Pharmacy.*

ON THE THERAPEUTIC PROPERTIES OF CREOSOTE.

BY BENJAMIN W. RICHARDSON. LIC. FAC. PHYS. AND SURG., GLAS.

DURING the last visitation of Asiatic cholera, my attention was called to two short papers in the Medical Gazette and Lancet, from the pen of Mr. Spinks, of Warrington, on the good effects of creosote in the treatment of that formidable disease. As the epidemic had nearly passed over before I read these papers, and as my attention at that time was somewhat diverted from the subject, I did not obtain an opportunity of testing the effects of creosote in the treatment of true Asiatic cholera. Since then, however, I have given this medicine a very fair trial in the treatment of *ordinary diarrhœa*, and I am bound to admit, that, so far as my own observation goes, there is no astringent remedy half so useful, in certain cases of profuse purging.

The cases in which I have found creosote most valuable are of three kinds:—

1st. Cases where purging appears, and cannot be traced to the presence of foreign matters in the intestines, as so often happens during ordinary epidemics.

2ndly. Cases where a diarrhœa follows the administration of purgative medicines given for the purpose of removing foreign matters from the intestines.

3rdly. Cases where after an acute diarrhœa, a state of passive purging continues,—the patient being constantly troubled with sudden small liquid evacuations, not attended with great pain, or any considerable constitutional disturbance.

From the first-named class of cases I could give numerous instances illustrative of the good effects of the remedy in question. During the late diarrhœal epidemic many of these cases have come before me; but, to save time, I shall only state that, in no case of the kind, have I seen the remedy fail, and that, in most instances, from two to four doses of the medicine have been sufficient to check the evacuations.

Of the second variety I have also seen several examples. The following case affords a good illustration:—In the month of August, 1850, I was one morning hastily summoned to Chiswick to visit an aged lady, who was suffering from diarrhœa. I found that on the previous day she had been eating heartily of some kind of indigestible food, and feeling uneasy sensations in consequence, she had taken a smart dose of some aperient medicine. The effect was a profuse action of the bowels, continuing for many hours, and reducing her to a deplorable degree. At the time of my visit she presented the following symptoms: the diarrhœa was constant,

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the matter evacuated being thin, and but little colored. The pulse at the wrist was nearly imperceptible, the surface of the body was cold, the lips were blue, the abdominal muscles were painfully contracted, and the voice was greatly diminished in force. I prescribed creosote two minims, with half a drachm of sulphuric ether, to be given immediately in a little syrup, and to be repeated every one or two hours. A little brandy and water was also recommended at intervals, and light mucilaginous drinks. The body to be kept warm. On calling again in the evening of the same day, I was delighted to find my patient much better; she had rallied considerably after the first dose of creosote and ether; the diarrhœa had diminished, and by this time had ceased altogether, two more doses having been given. I now stopped the medicine, and the diarrhœa did not return; for a day or two some slight symptoms of thirst appeared, but these passed off, together with the prostration consequent on so severe an illness, and in the course of three weeks perfect recovery had taken place.

Of the third class of cases I have not seen so many examples as of those previously named, but the following is one of the kind:—A gentleman who was travelling was seized with an ordinary attack of diarrhœa, for which he took medicine with much relief; still his recovery was not complete. He did not suffer from pain, but three or four times in the course of the day he would be suddenly troubled with a small liquid evacuation. This was a great annoyance, and he was treated for it in various ways, by mild purgatives, and also by all the ordinary astringents, but with no avail. He returned to town and resumed his usual pursuits, but the purging, notwithstanding the most careful diet, continued to tease him. Creosote was at last prescribed, in a minim and a half dose, combined simply with syrup of tolu, and a little water. The effect was most satisfactory. The remedy was taken but twice, when the disagreeable symptoms entirely passed off. Ten days after they slightly returned; but one repetition of the dose named above effectually checked a relapse, and since then (nine months ago), the bowels have acted quite normally.

The advantages which creosote seems to possess over the other astringents, are:—1st. That it succeeds when others fail. Of this fact I am quite convinced: I have, during the late months, when diarrhœa has been so common, selected at the same time similar cases, and whilst treating one with creosote I have treated the others with opium, chalk, or some similar remedy. In such trials I have unexceptionably found the purging arrested much more readily and effectually by the creosote, and in many cases, other remedies having singularly failed, this one has been prescribed afterwards with the best results. 2ndly. It is very speedy in its action. 3rdly,—and this is a great advantage,—it rarely leaves the bowels constipated. In the course of its administration I have sometimes seen it produce symptoms of dryness of the mouth, with a white filmy state of the tongue, and a little excitement. Under such circumstances, the remedy is better discontinued; indeed it is not often wanted after these symptoms, inasmuch as the diarrhœa is usually checked before the appearance of them.

With children the remedy is also useful; but, to secure success with them, the dose must be very small,—the one-fourth, one-sixth, or one-eighth of a drop to children under two years, is sufficient. With adults from one to two drops is the dose I usually prescribe, and this may be repeated every two or three hours for several times if required.

I am happy to see that the value of creosote as a remedy for diarrhœa has not escaped the notice of other observers. In the last volume of the LONDON MEDICAL GAZETTE, there is a paper by Mr. Kesteven on this subject, in which he praises the remedy greatly. Mr Kesteven also offers the theory, that the good effects of creosote in diarrhœa may arise from its power in coagulating albuminous solutions. There is, however, a great objection to this theory, in the fact that to coagulate albumen a large quantity of creosote is required; so that the small doses medicinally administered cannot be supposed as sufficient to produce such coagulation in the intestines.

I must just add one word with reference to some of the other therapeutic properties of creosote. In elementary treatises on therapeutics, I find ascribed to it, narcotic, sedative, and diuretic properties. To none of these effects can I myself bear witness. I have never seen the least approach to narcotism or diuresis on any occasion, from the doses named above; whilst, on the circulation, I am quite sure it acts rather as a stimulant than as a sedative. Its power to arrest vomiting depends upon the dose: given in a full dose,

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two drops, I have seen it even bring on vomiting; in which case a few minims of dilute hydrocyanic acid are usefully combined with it. At the same time, I may observe that I have seen diaphoresis follow its administration, and that it possesses very excellent antispasmodic properties. I have also found it very useful in arresting hiccup in cases of exhaustion. To disguise the nauseous qualities of creosote, no vehicle seems to me to answer so well as the syrup of Tolu, to which compound tincture of cardamoms may be added. It is also very advantageously combined with opium, or with the preparations of ether, in cases where these remedies are indicated.

In concluding this notice of some of the properties of creosote, I have only to observe, that I do not speak of its effects from a small number of cases, or a short period of trial.

I have tested the remedy impartially for many months, and, having thereby formed so favorable an opinion of its use, I have considered the matter as one of sufficient interest to be brought before the notice of this medical society.—*The Medical Society of London,* October 18th, 1851.

THE DIFFICULTY OF BREATHING FROM AN OVERDOSE OF OPIUM RELIEVED BY INHALING STEAM.

THE difficulty of breathing commonly met with in cases of poisoning with opium, is generally ascribed to paralysis of the respiratory muscles caused by the drug; but Dr. C. W. Wright ascribes it (*Western Lancet*, Jan. 1851) to the dryness of the mucous membrane of the lungs, caused by the opium.

"It is absolutely necessary," he remarks, "that the mucous membrane of the lungs should be kept constantly moist, otherwise it is impossible for oxygen gas to be absorbed, and carbonic acid eliminated. It is observed, in some cases of poisoning, with opium, that the mouth and fauces become so dry that it is almost impossible for the patient to swallow or speak, and that if the dose is sufficiently large, this dryness may extend into the respiratory organs, and thus give rise to great difficulty of breathing. In these cases the patient is not so much disposed to sleep as when this symptom is not observed.

"Having seen this effect of opium in several cases, I had determined to try what effect the inhalation of steam would have in mitigating the unpleasant symptoms thus induced. This I was enabled to do in my own case, a short time since, from having taken by mistake an overdose of opium, which could not have been less than ten grains. In this instance, the first warning of the mistake I had committed was embarrassed respiration, which soon amounted to an agony, without the least symptom of narcotism. In this case much the same sensation was produced by each inspiration as is experienced by the inhalation of pure nitrogen gas, the air seeming to leave the lungs without having performed its functions, there being at the same time a sense of dryness in the fauces and larynx. In this condition I commenced breathing the vapor of hot water, which produced immediate relief. After this, having ejected the poison from the stomach by an emetic, no unpleasant effect followed.

"When it is remembered that the power which a membrane possesses of absorbing a gas is in proportion to its moisture, and that a dry one is as impenetrable to gases as horn, it is not surprising that the above symptoms should be induced by opium, which, above all other substances, has the property of diminishing the secretion of the mucous membrane. It should also be borne in mind that, by arresting the pulmonary secretion, the blood loses its attraction for the mucous membrane lining the lungs.*

"Probably the best treatment which could be adopted, where this symptom is observed, would be to allow the patient to inhale the nitrous oxide gas saturated with vapor, which would have the effect of restoring the moisture of the lungs, and presenting oxygen in a much more soluble form than that which enters into the composition of the atmosphere."—*American Journal of the Medical Sciences.*

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* See Liebig's late work on the motion of the juices in the animal body.

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

MEMOIR ON THE ESTIMATION OF BROMINE.

BY M. LOUIS FIGUIER.

THE estimation of bromine, that is to say the determination of this body in a mixture of chlorides and bromides, is one of the most difficult operations of chemical analysis. The analogies which chlorine and bromine present to each other are so close, that all the corresponding combinations to which these bodies give rise seem to be confounded in their chemical properties. The solubility and insolubility are perceptibly the same in the compounds of chlorine and in those of bromine, and, consequently, it becomes almost impossible to separate these two bodies by the formation of insoluble precipitates, according to the ordinary method of chemical analysis.

"Chlorine and, bromine, and the corresponding chlorides and bromides," says Professor H. Rose, in the second edition of his Treaitse on Chemical analysis, "have so much analogy with each other, that we are not yet acquainted with any accurate mode of separating bromine from chlorine."

I shall not here enter upon a critical review of the various processes which have been proposed or are now practised for the analytical estimation of the bromides. I shall, on this point, refer to the experience of chemists. Every one knows that the various methods proposed for this object present many practical difficulties, even when the bromide to be ascertained is in very large proportion, and that their application becomes impossible or extremely defective, when the bromides are in very small quantity relatively to the chlorides. Such however is the most general case. In mineral waters, sea water, the water of salt lakes, the residues of saline springs, &c. in which the bromides occur, they are found associated in very small proportions with considerable masses of chloride of sodium and other chlorides. In this case, I do not hesitate to say that the employment of the processes described in treatises on chemical analysis is entirely illusory. Having found myself many times in a position to prove this fact, I determined to seek a process of analysis capable of easily estimating bromine in mixtures containing even the smallest proportion of it. I think that I have solved this problem by the employment of a solution of chlorine of known strength. It was at the suggestion of M. Balard that I tried this means of analysis; but several difficulties presented themselves: in the first place, how was the precise moment at which the bromide ceases to be decomposed by the chlorine to be recognised? As there is here no formation of precipitate, it seemed impossible to seize the exact moment when this action stops: but the observation of a fact important in this point of view, has enabled me to overcome this difficulty. If we take a saturated solution of bromine, which is of a deep yellow color, and boil it for a few minutes, the bromine gradually entirely disappears, and the liquor soon becomes perfectly colorless. This fact evidently enables us to put in practise the analysis of the bromides by means of a solution of chlorine. Indeed

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the bromide being decomposed by chlorine, the liquor acquires a very intense yellow color owing to the bromine set free: but, if the liquid be boiled, all the bromine is disengaged in a few minutes, and leaves the liquor perfectly colorless. More chlorine may then be added, and this treatment repeated until action completely ceases, which may be known by the addition of chlorine producing no yellow color in the liquid.

Thus this means of analysis was practicable in principle; it remained to be assured of some particular conditions which the practice of this process must require.

It was necessary at once to ascertain to what extent, in an accurate analysis, a solution of chlorine of known strength might be used. All chemists think, indeed, that the solution of chlorine in water decomposes with great rapidity; it was necessary to ascertain whether this decomposition were too active, and whether the permanence of the strength of this solution were so decided that sufficient confidence could be placed in this reagent as a means of analysis. Experiment has shown me that if we take the precaution of keeping the solution of chlorine in a bottle covered with black paper, in order to exclude light from it, the decomposition of the water is so slow as to be unimportant. I took a solution containing 5 decigrammes of bromide of sodium; for complete decomposition, it required 115 divisions of chlorine contained in a graduated burette. The experiment was repeated 24 hours after, with the same quantity of salt and the same solution of chlorime. To obtain the same effect, 122 divisions had to be employed. The decomposition was a little more active with a more dilute solution of chlorime. A solution containing 5 decigrammes of bromide of sodium required, for complete decomposition, 260 divisions of chlorine; on repeating the experiment 24 hours after, 295 divisions were required to produce the same effect. These results demonstrate that the decomposition of the solution is so slow as to constitute no obstacle to its employment as a test liquor. Care being taken to ascertain the strength of the liquor at the time of using it, the interval of about half an hour which elapses in submitting to the action of the solution of chlorine the mixture to be analysed, can exert no influence on the result. When I have made the analysis of several mixtures at once, an operation which occupies several hours, I have taken care to test the chlorine liquor at the beginning and end of the experiments, and to take the mean of the two numbers. The difference between these results, taken at several hours' interval, was so slight as to be neglected. Rendered into the weight of the bromine, it represented only some tenths of a milligramme, a quantity inappreciable to the balance.

Theory indicates that, to ascertain the strength of the solution of chlorine, any soluble bromide may be used; thus, a solution of chlorine tested with bromide of sodium may be used not only for estimating bromide of sodium, but also for the bromides of potassium, magnesium, &c. Indeed, according to the law of equivalents, it is always the same weight, or 1 equivalent of bromine, which is combined with the various metals, and the quantity of chlorine necessary for expelling the bromine from its metallic combination is always the same, whatever metal this body may be combined with. Although theory enabled me to establish beforehand the truth of this result, it was necessary to ascertain its reality by experiment.

I therefore dissolved in water 5 decigrammes of bromide of sodium, and I accurately decomposed this solution with a solution of chlorine of known strength; it required 244 divisions of the liquor. Again, I dissolved in water 5 decigrammes of bromide of potassium, and I found that by employing the same test solution, it was necessary to employ 212 divisions of the burette. This practical result agrees with the indications of theory. Indeed, 5 decigrammes of bromide of sodium contain, according to the known composition of this salt, 388 milligrammes of bromine, and 5 decigrammes of bromide of potassium contain 335 milligrammes of bromine. 244 divisions of chlorine are necessary for expelling from combination the 388 milligrammes of bromine contained in the bromide of sodium. If then we place the proportion

$$0{\cdot}338 : 244 :: 0{\cdot}335 : x$$

we shall obtain the number of divisions of chlorine theoretically required for decomposing 5 decigrammes of bromide of potassium. By executing the proportion, we find for the value of x, the number 210. Thus, theoretically, the 5 decigrammes of bromide of potassium required 210 divisions of chlorine, a number which is sufficiently near to the number 212 obtained by experiment. A liquor whose strength has been determined with bromide of sodium enables us therefore to estimate bromine in the state of bromide of potassium, magnesium &c., it gives as a result the absolute quantity of bromine; this bromine may be after-

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wards assigned by calculation to the different metals with which it is combined.

The mother liquors of salt-springs in which bromine has to be sought for sometimes have an alkaline reaction; this reaction may moreover be communicated to them in the course of the operations of analysis, and, for example, when sea-water and mineral waters which certain chlorides or bromides of magnesium are evaporated to dryness.

Indeed the chloride of magnesium in being decomposed by heat, liberates hydrochloric acid, and leaves in the liquor a basic subsalt. This circumstance would be a cause of error in the employment of solutions of chlorine of known strength; for the small quantity of magnesia or of subsalt of magnesia, which forms part of this mixture, would absorb a certain quantity of chlorine, and thus this chlorine may be falsely attributed to bromide decomposed. To avoid this cause of error, the liquid must be acidified But here a danger presents itself:—Would not the acid employed decompose the bromide, so as to cause, under the form of hydrobromic acid, the loss of a certain quantity of bromine? Experiment has shewu us that, when hydrochloric acid is used for acidifying the liquors, the result is not influenced by the presence of that acid. I decomposed, by means of a solution of chlorine of known strength, 3 decigrammes of perfectly neutral bromide of sodium: 118 divisions of chlorine were required. I repeated the same experiment after adding to the liquor 10 drops of hydrochloric acid. The operation gave, in the acid liquor the same result as in the neutral solution. Thus, the presence of hydrochloric acid does not alter the result. We may therefore operate on liquors rendered slightly acid by eight or ten drops of hydrochloric acid. Only it is good, in order to be placed on the same conditions, to acidify in the same manner the bromide of sodium used for testing the chlorine.

I need not say that I have ascertained the accuracy of this mode of analysis by determining by means of it the composition of various mixtures, in which I had dissolved different proportions of bromide of sodium and bromide of potassium. Whether the proportion of these bromides was small or large, the result was the same, and I was enabled to estimate accurately and with great facility the quantity of bromide which I had added to the mixture.

As to the degree of precision of which this method is susceptible, the following facts may serve to fix it. When we dissolve in water 5 milligrammes of fused bromide of potassium, this liquor becomes of a deep yellow by the action of a dilute solution of chlorine; this color disappears by boiling, and a further addition of chlorine colors the liquid again. If, instead of acting in pure water we use a liquid charged with salts, 5 milligrammes of bromide of potassium are not easily detected by chlorine water, but 1 centigramme of bromide is easily recognized. I dissolved in distilled water 45 grammes of quite pure common salt, and added to the solution 1 centigramme of fused bromide of potassium. The liquor turned yellow by the addition of a solution of chlorine, the color disappeared by boiling, and reappeared under the influence of a fresh addition of chlorine. One centigramme of bromide of potassium may therefore be detected without any difficulty, and may even be estimated by this method.

We will now point out how the operation is put in practice. In the first place, a solution of bromide of sodium containing a known weight of that salt, in a determined volume of distilled water, is prepared. I ordinarily use a solution of 2 grammes of bromide of sodium in 400 cubic centimetres of water: 100 cubic centimetres of this solution contain, therefore, 5 decigrammes of bromide of sodium. This liquor serves for testing the solution of chlorine at the time of analysis. For that purpose, a few drops of hydrochloric acid are added to 100 cubic centimetres of this solution, then it is ascertained what volume of the solution, of chlorine, must be employed for decomposing it. A graduated tube, divided into 100 equal parts, serves for containing the solution of chlorine. The small test glass with a foot, divided into 100 parts of the alkalimeter of Descroisilles, served me for a burette; it is very convenient inasmuch as its capacity admits of its being corked, so as to avoid loss of chlorine in the air. It is advisable, in the course of the experiment, to keep it covered with a black paper, which may be removed to read the divisions.

This small graduated test glass being filled with chlorine water, a certain quantity of this reagent is poured into the normal solution of bromide of sodium, placed in a small glass flask. The liquid immediately turns yellow, owing to the liberation of bromine. The flask is then placed on a fire or over a spirit lamp, and the liquid is boiled. After two or three minutes' boiling the liquor becomes perfectly colorless. It is removed from the fire, cooled for a minute or two, and chlorine is again added. On again boiling the liquor the bromine is disengaged, and the liquor again becomes

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colorless. By repeating this treatment we are enabled to determine approximatively the number of divisions which must be employed for decomposing the normal liquor. This term being known, the same operation is performed a second time, which permits us to determine the strength of the normal solution in a definitive manner.

The strength of the chlorine water being thus exactly fixed, the determination of the bromine contained in the liquor to be analysed must be proceeded with. For this purpose we operate in the same way as in testing the strength of the chlorine. If, for example, we have to operate on a mineral water, this mineral water previously concentrated, is placed in a small glass flask, acidulated with eight or ten drops of hydrochloric acid, and we ascertain by the foregoing method the quantity of chlorine which must be employed so that the liquor may give no further trace of yellow coloration under the influence of chlorine. A first operation serves to determine this quantity approximatively; a second operation, performed by employing the same quantity of mineral water, serves to fix it definitively. When the number of divisions of chlorine necessary for decomposing all the bromide of the mineral water is known, we have all the elements of the analysis. Indeed, it is sufficient to establish a proportion for ascertaining how much bromide of sodium the quantity of chlorine employed represents: the quantity of bromine in weight which this bromide of sodium represents is afterwards determined by calculation. If, in the mineral water examined, the bromine is in the state of bromide of potassium or magnesium, the bromine is combined by calculation with potassium or magnesium. If, on the contrary, as is most commonly the case, the bromine exists in the mineral water in the state of bromide of sodium, the operation furnishes directly the quantity of bromide of sodium, since this compound has been used for determining the strength of the normal solution of chlorine.

Such is, in detail, the method which I propose for the analytical estimation of bromine. With regard to promptitude and convenience of operation, it combines, I think, all the conditions to be desired. I hope that the chemists who may repeat it will appreciate its advantageswith regard to accuracy. But I must add that it presents a peculiar superiority over the old processes inasmuch as it enables us not only to fix the quantity of bromine, but also to recognise the state in which this simple body exists in a mineral water, a condition which has not been realised by the methods hitherto known.

It is known that bromide of magnesium, like the chloride of that metal, loses a portion of its bromine, when its aqueous solution is evaporated to dryness. When a solution of bromide of magnesium is evaporated to dryness, towards the end of the operation the salt is partly decomposed; the water and the bromide are decomposed together, and a very evident odor of hydrobromic acid is perceived. This fact may be turned to account for determining whether the bromine in a mineral water is combined with sodium alone or whether it is united with magnesium. For that purpose, it is necessary to perform two operations. In the first is determined, by means of the solution of chlorine, the total quantity of bromine which exists in the mineral water. The same quantity of mineral water as thus operated on is then taken and evaporated to dryness. By this evaporation, the bromide of magnesium existing in this water is decomposed, and loses a portion of its hydrobromic acid. To urge as far as possible the total decomposition of this bromide of magnesium, care is taken to add to the dried residue a small quantity of water, and to evaporate again to dryness. It may be considered that, by repeating these evaporations six or seven times, the whole of the bromide of magnesium has been destroyed and lost its bromine. If, then, this residue be redissolved in water, a few drops of hydrochloric acid added to it, and the quantity of bromine which it contains also determined, we find, if bromide of magnesium existed in this mixture a lower number than the first, since a portion of the bromine, belonging to the bromide of magnesium, has been dissipated by evaporation. The difference between the two numbers thus obtained must evidently represent the bromine of the bromide of magnesium which has disappeared during the evaporation. We therefore combine this difference with magnesium by calculation, and state that the bromine thus determined existed in the state of bromide of magnesium. But if the results of these two operations present no difference, and if the same quantity of bromine be found in the mineral water evaporated to dryness and in the same water simply concentrated, it may be concluded that the bromine existed in the water entirely in the state of bromide of sodium.

The following are two examples of these cases:—

I took 58·85 grammes of the mother liquor of the saline spring of Kreuznach, of

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the density of 1·293, and I determined, without evaporating it, the quantity of chlorine necessary to be employed for expelling all the bromine which it contained. To produce this effect, 270 divisions of chlorine had to be employed. I then took 55 grammes of the same mother liquor, evaporated it to dryness, and added distilled water to the residue, five or six times, so as to aid these little evaporations as much as possible. On redissolving these residues in water and adding to the solution a few drops of hydrochloric acid, I found that, to drive off the whole of the bromine existing in the residue, only 208 divisions of chlorine were required. By calculating on these data, I proved that the mother liquor of Kreuznach contained, in 1 kilogramme of liquor, 8·70 gr. of bromide of sodium and 2·6 gr. of bromide of magnesium.

By operating in the same manner, I ascertained that 145 grammes of mother liquor of Nauheim, not evaporated, required 208 divisions of chlorine, whilst the same weight of this mother liquor evaporated to dryness and redissolved in water, required only 44 divisions of the same solution of chlorine for the decomposition of the bromide. From this I concluded that 1 kilogramme of mother liquor of Nauheim contained 2·60 of bromide of sodium and 1·43 of bromide of magnesium.

By an operation of the same kind, I found that the mother liquor of Salis, in Bearn, of the density of 1·218, contained 1·60 of bromide of sodium and 63 centigrammes of bromide of magnesium.

The following is another case in which I have been able, thanks to the employment of this means, to prove that the bromine of a mineral water exists entirely in that water in the state of bromide of sodium.

I analysed the water of the Mediterranean with reference to the quantity of bromine, and I wished to fix the form in which this body exists in it I took 1 litre of sea water collected at Cette, at some distance from the coast, and I concentrated it. In his remarkable memoir on the analysis of the water of the Mediterranean M. Uziglio ascertained that the bromide of sodium begins to separate when the sea water is brought, by evaporation, to 25 degrees of the aerometer. I therefore took the precaution to stop the evaporation at 25 degrees, that is to say, when the liquid occupied a volume of 112 cubic centimetres. I then determined, by means of the solution of chlorine of known strength, the quantity of bromide of sodium which existed in this mixture. I found that it contained 121 milligrammes per litre. I then took 1 litre of the same water, evaporated it to dryness and redissolved the residue in distilled water five or six times, so as to decompose, in the course of these repeated evaporations, any earthy bromides which might exist in this residue. The saline mixture, redissolved in water, filtered, and a few drops of hydrochloric acid being added, was analysed by means of the solution of chlorine of known strength. I found as a result 119 milligrammes of bromine. The difference between these two results is so trifling that I attribute it to some slight error in the operation, and that I regard as identical the numbers obtained in these two operations. It results from this that 1 litre of the water of the Mediterranean, taken at Cette, contains 121 milligrammes of bromide of sodium and no bromide of magnesium.

This number, I may mention in passing, differs considerably from that given by M. Uziglio, for the water of the Mediterranean taken in the same locality. That chemist, found, indeed, that 1 litre of this water contained 570 milligrammes of the same salt. I hope that M. Uziglio will be kind enough to repeat this determination, and to settle, with the precision which is familiar to him, on which side the error lies.—*Annales de Chimie et de Physique*, Nov., 1851.

(To be continued.)

ON THE FORM IN WHICH THE OXYGEN ABSORBED IS CONTAINED IN THE BLOOD.

BY PROFESSOR LIEBIG.

Two opinions have been given concerning the form in which the oxygen absorbed by respiration is contained in the blood.

Some physiologists, relying on the facility with which the oxygen contained in the blood is displaced by carbonic acid, consider that the first of these gases is not chemically combined with the blood, but simply dissolved in it. This view is quite incorrect. Indeed, whilst 1000 volumes of water shaken up with air, absorb, becoming completely saturated, 9½ volumes of oxygen, and 18½ volumes of nitrogen, (Gay-Lussac) 1000 volumes of blood absorb, according to the beautiful experiments of Magnus, 100-130 volumes of oxygen and 17-33 volumes of nitrogen. It is consequently evident that the oxygen absorbed by the blood is only partially contained in it in the state of solution; for the blood is rendered liquid by water which absorbs in equal volume = 11-14 times less oxygen. It is therefore indispensable to admit that this considerable

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solvent power which the blood possesses for oxygen, is due to the presence in this fluid of certain principles which have more affinity for oxygen than water has. The attraction which retains the oxygen combined with the blood is very feeble; but this is no reason for supposing that this gas is not chemically combined in it. We can increase the solvent power which water exerts on certain gases by adding to it substances which have an affinity, however feeble, for these gases. It is thus that phosphate of soda added to water augments its solvent power for carbonic acid. Water which holds in solution 1 per cent. of phosphate of soda, dissolves twice as much carbonic acid as pure water at the ordinary temperature.

A solution of sulphate of iron in water dissolves 40 times as much protoxide of nitrogen as pure water. *In vacuo* these two solutions give up the gases which they contained. The carbonic acid of the first solution may likewise be displaced by simply agitating the liquid with air, and the protoxide of nitrogen in the second may be driven off by agitating with carbonic acid. No one thinks of considering these facts, which greatly resemble those which take place in the blood, as a proof that carbonic acid and protoxide of nitrogen are contained in the state of simple solution, and not in that of chemical combination, in the water charged with phosphate of soda and sulphate of iron. It is known, indeed, that the solvent power of water for these gases depends on the proportion of salt dissolved. But since the quantity of gas absorbed augments in a fixed ratio with the proportion of salt dissolved, it is perfectly certain that the absorption depends on the salt and not on the water.

There are two conditions which modify the absorption of a gas, or the absorbent power of a liquid. The first is in some measure exterior: it is the pressure at which the gas is submitted to contact with the liquid. The second is chemical attraction itself, which is exerted by the constituent parts of a liquid.

In the cases wherein the absorption of a gas is not the result of a combination, but is made by virtue of a simple solvent action, the quantity of gas absorbed depends only on the external pressure; it increases or diminishes, according as the pressure is increased or diminished. In the case which we have just quoted, when the water charged with phosphate of soda has been charged at the ordinary pressure with carbonic acid and has thus dissolved twice as much carbonic acid as ordinary water dissolves, if the pressure be doubled, the solvent power does not increase in the same proportion, but in a much smaller proportion. The solution of phosphate of soda saturated with carbonic acid, absorbs, under double pressure, carbonic acid gas, as pure water saturated with carbonic acid would do: this absorption is not greater than in pure water, because the affinity which, in the solution of the phosphate increased the absorbing power, no longer continues to act, but ceases to be manifested, since it has been satisfied by the formation of a chemical compound.

The solution of sulphate of iron saturated with protoxide of nitrogen acts in the same manner when the pressure is increased. If 100 parts of this solution required for saturation at the ordinary pressure 100 vols. of binoxide of nitrogen, when the pressure is doubled, they will not absorb 100, but only 10 volumes of binoxide of nitrogen, the same quantity as pure water absorbs in the same circumstances.

The blood acts exactly like these saline solutions. If the oxygen were contained in the blood in the the state of simple solution, it would follow that the blood which absorbs 12 per cent of oxygen in air containing $\frac{1}{5}$ of its volume of this gas should absorb three times as much at a triple pressure, and five times as much with pure oxygen.

So long as it shall not be demonstrated that the absorbent power of the blood for oxygen varies with pressure, it must be admitted that the cause of this absorption resides in chemical affinity, giving rise to the formation of a true combination. On the one hand the experiments of MM. Regnault and Reiset, in which animals were made to respire in an atmosphere containing much more oxygen than ordinary air, and on the other the circumstance that in elevated regions, for example, on the plains of the Cordilleries, the functions of respiration are acomplished with as much regularity as on the coast, demonstrate that the quantity of oxygen absorbable by the blood is a constant quantity, and independent, to a certain degree, of external pressure.

In the environs of the lake of Piticaco, fifteen thousand souls inhabit the town of Puno, situated 12,000 feet above the level of the sea. The town of Potosi, in Bolivia, which is 12,600 feet above the level of the sea, contains thirty thousand inhabitants. In these elevated regions men inspire only two thirds of the quantity of oxygen taken into the lungs at each inspiration near the sea; if the quantity of oxygen absorbed by the blood diminished in the same proportion, is it not evident that such a variation would exercise on the functions of life an influence which would not have passed unperceived.—*Annalen der Chemie und Pharmacie.*

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MEMOIR ON THE DOUBLE CYANIDE OF POTASSIUM AND SILVER, AND ON THE PART WHICH IT PERFORMS IN ELECTRO-PLATING.

BY M. BOUILHET.

WHEN a salt of silver is put in contact with cyanide of potassium, a coagulated precipitate of cyanide of silver and a salt of potassium is formed; by adding an excess of the reagent, the precipitate is dissolved, and we then obtain a crystallisable salt called the double cyanide of potassium and silver.

In a weak liquor this salt crystallises in small and perfectly detached rhombohedra, the formula, according to the experiments of Messrs. Glassford and Napier, is

$$CyK, CyAg + HO.$$

In a concentrated liquor it crystallises under the form of small hexagonal tables. In this case, it does not contain water; its formula is

$$CyK, CyAg.$$

But, whatever may be their crystalline form, the solution of these salts acts in the same manner on the bodies with which they are put in contact. Among the most remarkable properties of this solution, I will mention one which has long been known.

When it is subjected to the action of a battery, metallic silver is deposited on the negative pole in a thin layer and adhering to the metal, and there is dissolved at the positive pole, where a plate of silver is placed, a quantity of that metal equivalent to the quantity of silver deposited.

It is already known that by putting a salt of silver in contact with yellow or red prussiate solutions are obtained which, under the influence of the battery, are decomposed in the same manner.

But it was important to ascertain whether in these prussiates, as in the former, it was not the solution of the same salt in water which produced the silvering, and whether in liquids prepared with the ferrocyanides the iron was an element essential to the success of the operation, as some chemists, and especially MM. de Ruolz and Flandin, have supposed. Was it not more probable, from the facts so well demonstrated by Gay-Lussac, that the iron was completely without influence on the results.

I prepared a bath of such a kind that the proportions employed, although different, did not deprive the definitive liquid of the property of silvering.

These proportions were:—

Yellow prussiate ..... 1 part
Cyanide of silver ..... 8 „

The solution was effected at the end of a certain time, a blue precipitate being formed in the liquid; when filtered, it was colorless and contained a crystallisable salt.

This solution silvered, and yet a qualitative analysis gave me as the elements of this salt cyanogen, potassium and silver. The iron was therefore completely eliminated.

It remained to ascertain in what proportions they were combined, and what formula should be assigned to them.

Estimating the silver in the state of chloride, the potassium in the state of sulphate of potassa, and the carbon and nitrogen by burning with chromate of lead, I obtained the following results:—

	Found.	Atoms.	Calculated.
Silver	54·33	1	54·27
Potassium	19·63	1	19·60
Cyanogen	26·65	2	26·13
	100·61		100·00

The formula which must be assigned to these salts is therefore

$$CyK, CyAg.$$

This formula is so much the more certain, as if we calculate for the foregoing analyses the weight of the double cyanide according to the weight of sulphate found, we have

$$0{\cdot}634 : x :: 243 : 199.$$
$$x = 0{\cdot}519.$$

0·519, the number calculated, instead of 0·520 the number employed, very clearly demonstrates that the salt has the formula

$$CyK, CyAg.$$

Hence it is evident that the agent of the silvering, in the yellow prussiate, is the double cyanide of potassium and silver. By what reaction is it formed? I have endeavored to ascertain this by experiment.

When a salt of silver is put in contact with ferrocyanide of potassium, a salt of potassium and ferrocyanide of silver are formed. The latter is very unstable; it readily separates in the air into protocyanide of iron and cyanide of silver.

This cyanide of silver itself acts as a salt of silver and again forms ferrocyanide of silver and a salt of potassium—the simple cyanide of potassium.

The latter, in contact with the cyanide of silver, forms the double salt which we have found, which alone is soluble, whilst the other elements remain in the state of precipitate or are precipitated by cooling.

When the reaction is effected out of contact with the air, the precipitate continues grey; in contact with the air, it becomes blue. Treated by an acid or by chlorine, it becomes blue more rapidly; potassa turns it brown; it is, therefore, protocyanide of iron.

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The reaction may be expressed by the following formula :—

$$2CyAg+Cy^3FeK^2=2CyKCyAg+CyFe.$$

I repeated these experiments with the red prussiate; the baths were prepared in the same manner, and the results were the same: the iron was eliminated and the bath still silvered.

The crystallised salt gave me by analysis:

	Found.	Atoms.	Calculated.
Silver	53·98	1	54·27
Potassium	19·68	1	19·60
Cyanogen	26·68	2	26·13
	100·34		100·00

By calculating the weight of the double cyanide from the weight of the sulphate found, we have :—

$$533 : x :: 243 : 199.$$
$$x = 0{\cdot}438.$$

0·438 calculated, instead of 0·440 employed, a result which very clearly demonstrates that the formula of the salt is

CyK, CyAg.

Therefore, in the red prussiate, as in the yellow prussiate and the white prussiate, the salt which effects the silvering is indeed the double cyanide of potassium and silver.

When the reaction is carried on out of contact with the air, the precipitate becomes brick-red, disengaging hydrochloric acid: the precipitate was only peroxide of iron.

From the ultimate products of the reaction, namely, the double cyanide of potassium and silver, and peroxide of iron, which formation may be explained by the following reaction :—

$$Cy^3Fe^2+3HO=Fe^2O^3+3CyH,$$

it may be concluded that the reaction would be of the same nature as that established for the yellow prussiate; only, instead of protocyanide of iron being formed, as in the first case, sesquicyanide is produced; the reaction may be expressed by the formula

$$3CyAg+Cy^3K^3Cy^3Fe^3=Cy^3Fe^2+2CyK,$$
$$CyAg.$$

It is therefore evident that the silver does not precipitate, properly speaking, the iron from these cyanuretted combinations; but, in consequence of the general reaction of the metallic salts on the ferridcyanides, and of the cyanide of potassium on the ferrocyanide of silver, proved by Messrs. Glassford and Napier, the cyanide of silver combined with the cyanide of pctassium which it had set at liberty.

By silvering with these three salts dissolved simply in water, I obtained identical results. The objects thus silvered are deposited at the office of the Academy.

To sum up, whatever prussiate may be employed, simple cyanide, ferrocyanide or ferridcyanide of potassium, for making a bath for silvering, by adding to one of these salts cyanide of silver or any other salt of silver, a solution is obtained of one and the same salt, the double cyanide of potassium and silver. This solution, in all three cases, equally effects silvering. In all three cases the silvering agent is the same, and possesses the same properties, although the matters which have been used for producing it have different properties. — *Comptes Rendus*, No. 22, December 1, 1351.

ON THE FUNCTIONS OF THE BILE.

BY M. REINHOLD SCHELLBACH.

PHYSIOLOGISTS have given two opposite opinions relative to the part performed by the bile. Both are based on facts observed in dogs in which biliary fistulas had been made. Schwann proved that dogs subjected to this operation decayed and very soon died; from this he concludes that the bile is a secretion indispensable to life. M. Blondlot, on the other hand, observed a dog under the influence of a biliary fistula, which, after having become thin for fifteen days, improved in condition until it was killed (three months after the operation.) This physiologist regards the bile as an excrementitial fluid. This conclusion has been regarded as exaggerated, and it has with reason been objected to M. Blondlot that he had neglected to ascertain by dissection that the ductus choledocus was not re-established. New experiments have been made on this subject by Schwann, Nasse and Bidder, but they have not completely cleared up the question.

The author therefore undertook new researches on the functions of the bile, and performed the operation of blliary fistula on six dogs. He communicates in his work the observations which he has made on one of these dogs, from which he extirpated the spleen. He ascertained that this organ exerts no influence on the secretion of bile.

The dog on which he operated on the 15th of February weighed at that time 5.580 kilogr. Soon after he ate 100 grammes of meat, and on the third day 630 grammes. In general, it was observed that its appetite had increased, and at the end of two months its weight had not perceptibly diminished. Whilst dogs of five and six kilogrammes subsist perfectly well on 200 to 300 grammes of meat per day, the dog with the biliary fistula consumed on the average nearly

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500 grammes of meat or 240 grammes of bread.

The excrements of this dog were more abundant than in the normal state. They were liquid when the dog had eaten fat meat. Their odor was very disagreeable, and their color varied from black to ashy grey. They were so much the less colored as the dog had eaten more fat. When they were clear and liquid, this substance appeared to form their principal element, as was ascertained by means of the microscope. No undigested vegetable or animal matters were ever found in these excrements.

In order to be able to form an idea of the digestive faculties of this dog, its food and its excrements were analysed. The peculiar arrangement of the cage in which it was confined enabled the author to collect, not only its excrement, but also its urine. It was muzzled to prevent it from licking up the bile which issued from the fistula. We here give the results of these analyses.

	Dog with a biliary fistula.		Normal dog.
	1st Experiment.	2nd experiment.	
The food contained in the dry state.:—	3 days.	5 days	5 days.
	gr.	gr.	gr.
Fat	180 000	113.600	460·500
Other solid matters	1100·000	693·200	,,
Quantity of the Excrements:—			
In the humid state	"	180·000	97·300
In the dry state	138·100	124·000	40·980
The Excrements contained in the dry state:—			
Fat	70·400	59·500	7·812
Fatty acids	14·600	12·700	5·788
Other solid materials	53·100	51·800	27·380
	per cent.	per cent.	per cent.
Quantity of fat digested	52·78	36·45	97·05
Quantity of fat undigested	47·22	63·55	2·95
	100·00	100·00	100·00
		per cent.	per cent.
Mean of fat digested		46·35	97·05

In comparing these results, it is very easy to see that the dog with a biliary fistula did not digest half of the fat swallowed, whilst the healthy dog digested nearly all. As the two dogs experimented on were not of the same weight, it is necessary, so as to have comparable results, to bring them to the same weight, to 1 kilogramme for example. By making this correction, we find the followingcyphers:—

	I.	II.	Mean.	IV.
	gr.	gr.	gr.	gr.
Quantity of fat digested by the entire dog in 24 hours	11·90	8·28	10·5	89·30
Per kilogramme	2·16	1·50	1·90	11·17
Per kilogramme and per hour	0·09	0·06	0·08	0·46

From this it results that when the bile is wanting, fat is absorbed, but in much less quantity than in the normal state. In the foregoing experiments, this quantity amounted to only $\frac{1}{6}$ of the normal quantity. The digestion of albuminoid substances is not disturbed by the absence of bile, for the excrements contained, the fat being deducted, only 5·85 per cent. of the solid matter of the food.

To ascertain if this dog would digest vegetable food, the author fed it for eight days on rye bread. Under the influence of this regimen, the animal passed abundant excrements in which it was impossible to detect the least trace of starch. Its weight did not vary during the experiment.

The foregoing facts demonstrate that the bile is not essential to the digestion of albuminoid and feculent food.

The author adds that the dog passed a very great quantity of urine of normal color and appearance. In eight days this quantity amounted to 2800 grammes containing 183·12 grammes of urea.

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The dog was killed on the 11th of April. The chyle which was immediately extracted from the thoracic canal had not the milky appearance of ordinary chyle, but it was transparent and opalescent. All the dogs with biliary fistulas gave similar chyle, even when fed with food containing fat. The following is the analysis of this chyle which coagulated in two minutes:—

Water	941·58
Solid matter	58·42
	1000·00
Fibrine	1·02
Albumen	41.66
Fatty acids and other organic matters	8·34
Salts	7·40
	58·42

On *post mortem* examination the gall bladder was found to be converted into a long duct which opened externally. The cystic canal and the remaining end of the ductus choledocus were much enlarged. The latter terminated in a cul-de-sac a few lines from the duodenum. This was filled with grey floculent masses, and in the rectum was found a large quantity of grey excrement. In the body, only a very small quantity of fat was found; under the skin, there was none; in the abdominal cavity some was found only round the kidneys. The muscles were well formed. All the above facts seem to be connected and may receive, according to the author, a satisfactory explanation. The voracity of the dog and the absence of fat from his body are two correlative facts; the bile being absent, the animal was unable to absorb, under the form of fat, the quantity of carbon necessary for respiration and this deficiency of fat must be compensated for by a larger proportion of albuminoid matters. As meat, the fat being deducted, contains only 54 per cent. of carbon, whilst fat contains 78 per cent.; as, moreover, fresh meat contains only 20 per cent. of dry albuminoid matters, it is clear that to replace 1 gramme of fat, the dog must consume 9·16 gr. of fresh meat which contains an equivalent quantity of carbon.

In the course of the experiment, the author made observations on the secretion of the bile. It was sufficient to introduce a silver canula into the fistula to collect the bile secreted during a certain time. The numerous results which he has obtained in this respect have given the following mean quantities; the quantity of fresh bile secreted in twenty-four hours by the dog amounted to 164·43 grammes, which were reduced by desiccation to 6·980 grs. 1 kilogr of dog secretes therefore per diem 29·896 gr. of fresh bile, or 1·268 gr. of dry bile.

The author observes that this mean quantity is, probably, too high; for it must be admitted that the quantity of bile secreted under the influence of an exaggerated alimentation is greater than that which is secreted in normal conditions. For these reasons, the author thinks that it may considered that the quantity of bile secreted per kilogr. of dog scarcely exceeds 1 gr. (1·054 gr.)

Three or four hours after the meal, the proportion of bile secreted augments a little. Afterwards, it diminishes again. It augments from the fourteenth hour and attains its maximum in the fifteenth and and sixteenth hours. The question of the resorption of bile is of the highest interest, and has frequently been discussed. It is commonly sought to solve it by determining the quantity of bile contained in the excrements and by considering that the bile which is not found in these products of dejection must necessarily be reabsorbed. Observers are not quite agreed on this point of physiology. Whilst Pettenkofer found in the excrements no trace of a substance which could be colored red by means of a mixture of sulphuric acid and sugar, Lehmaun asserts that he has extracted small quantities of cholalic acid from the alcoholic extract of the excrements. Frerichs found that, in the large intestine, the soluble matters of the bile are diminished, and that the insoluble matters, as dyslysine and taurine, predominate. From this he concludes that the greatest part of the bile is rejected with the excrements.

It is evident that the question is far from being decided, and the author undertook some experiments in the hope of contributing to the solution of this important point of physiology. For this purpose, it was necessary to determine the proportion of bile which might be mixed with the excrements. The excrements of a dog weighing 8 kilogr. were collected for five days. The alcoholic extract of a portion of these excrements was treated with ether, which left a resinous residue weighing 0·862 gr. *(a)* 1·151 gr. of fat was dissolved in the ether and gave Pettenkofer's reaction.

The excrements exhausted by alcohol were treated with ether, and then digested with dilute hydrochloric acid. Exhausted with alcohol after this treatment, they gave an extract which abandoned to ether 1·311

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of fat, leaving a residue of a coloring matter weighing 2·1778 (*b*).

The author detected the presence of sulphur in residues *a* and *b*. The 0·862 which formed the portion of the alcoholic extract insoluble in ether contained—

Organic matters ..... (with 2·05 per cent. of sulphur.)			89·80
Inorganic matters.	Potassa.....	2·17	10·20
	Soda	6·15	
	Oxide of iron....	1·33	
	Phosphoric acid.	0·55	
			100·00

He concludes from this analysis that this portion of the alcoholic extract was formed of products of the decomposition of the bile, and of taurocholeïc acid (choleïc acid of Strecker). This opinion is based on the presence of sulphur and soda in this product. The residue *(b)* forming the portion insoluble in ether of the alcoholic extract obtained after the digestion with hydrochloric acid containing—

Organic matter..... (with 1·48 of sulphur)			60.00
Inorganic matters.	Lime.....	17·8	40·00
	Oxide of iron....	22·2	
			100·00

As the salts formed by the cholalic and choloïdic acids are soluble in alcohol, the author thinks that they should be found in the first alcoholic extract. The second alcoholic extract (*b*) contains, moreover, no substance capable of being colored red by sulphuric acid. The sulphur found in it, therefore, probably exists in it either under the form of a product of decomposition of the bile yet unknown, or as an element of the albuminoïd matters altered by digestion. The total quantity of dry excrements voided during the five days amounted to 40·9 gr., containing 3·80 gr. of residue (*a*) with 0·070 of sulphur and 8·60 gr. of residue (*b*), of which 5·77 gr. were organic matters containing 0.084 of sulphur.

It may, therefore, be admitted according to the foregoing experiments, that the quantity of bile ejected in the excrements of a dog weighing 8 kilogr., during five days, amounted to 3·80 gr., and if we wish to regard as biliary matter the 5·77 gr. of residue (*b*), which is scarcely admissible, this quantity, added to the former cypher, would form a total of 9.57 gr. of dry bile rejected in five days. Now, a dog weighing 8 kilogrs. secretes in five days 36 gr. of dry bile containing 2·16 gr. of sulphur. If we subtract from it 3·80, we obtain 32·20 gr., which would express the proportion of bile reabsorbed, and if we wish to adopt the least probable hypothesis, and regard as bile the 5·77 gr. of residue (*b*), subtracting from the 36 grammes of bile secreted the exaggerated cypher 9·57, we shall still find, for the quantity of bile reabsorbed in five days, the considerable quantity of about 26 grammes.

It results, therefore from M. Schellbach's experiments, that the bile should be regarded as a product of secretion, and not as a product of excretion. Whence, is it not evident that the sulphur reabsorbed with the bile must be finally oxidised in the organism, and pass into the urine in the state of sulphuric acid? The author goes further; he thinks that we may reverse the proposition and admit that the sulphur contained in the urine in the state of sulphate, added to the small quantity rejected in the excrements, was originally contained in the organism under the form of bile (taurine). —*Annalen der Chemie und Pharmacie*, New Series, Vol. III.

ON A PROCESS FOR PROVING THE PRESENCE OF WATER IN VARIOUS SUBSTANCES, AND ON THE DISHYDRATION OF ALCOHOL.

BY M. A. GORGEU.

THE presence of water in the alcohols and ethers may easily be detected by means of the property, which they possess, when they contain water, of rendering benzine turbid,* and, on the contrary, when they are anhydrous, of mixing with these liquids, producing only streaks.

The only condition necessary for detecting water in a liquid is that it must be soluble in benzine. To detect the presence of water in a liquid, in alcohol, for example, it is sufficient to pour a single drop of it into 3 or 4 cubic centimetres of benzine. If the drop falls to the bottom of the tube in which the experiment is made, without producing turbidness, it is because the alcohol contains more than a third of its weight of water. To ascertain that alcohol contains too much water to cause any turbidness, it is sufficient to add absolute alcohol to a small quantity of the liquid and to commence the test again. Whenever there is a production of turbidness, accompanied by small drops, we may be certain that the strength of the alcohol is between 65 and 93 centesimal degrees. If only a

* Benzine has for some time existed in commerce. It is extracted from the light oils of coal.

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cloudiness is caused, it is because the liquid operated on contains at most 7 per cent. of water. In this case, the turbidnsss may be made to disappear by the addition of a quantity of absolute alcohol corresponding to the quantity of water existing in the aqueous alcohol. The experiment is made by means of benzine, saturated [?] with water, in small, dry, short test tubes.

When an ether is to be tested, essence of turpentine should be preferred to benzine, as it has the advantage of producing a more lasting turbidness. The former liquid is not employed for detecting water in the alcohols, because it is less sensitive than benzine; indeed, alcohol of 98 per cent. does not render it turbid.

By operating as I have just indicated, 7 or 8 thousandths of water may easily be detected in alcohol, and 3 or 4 thousandths in ether.

Any substance soluble in both the liquid to be examined (alcohol, ether, &c.) and that which is used for the detection of the water, (benzine, essence of turpentine, &c.) does not impair the sensitiveness of the process, which is impracticable, on the contrary, when one of the former liquids holds in solution a substance insoluble in the others.

The property which aqueous ether possesses of rendering essence of turpentine turbid may be applied to the detection of hygrometric water in the salts. It is sufficient to leave them for a short time in contact with anhydrous ether and then to ascertain if this ether renders the essence turbid.

This mode of operating cannot be followed when there are insoluble substances in the essence which dissolve in the ether, or salts which are dishydrated by the latter liquid, for example, very efflorescent salts, as the crystallised phosphate, carbonate and sulphate of soda.

This process might be applied to the detection of interposed water in crystallised salts which are not very efflorescent, as sulphate of copper and sulphate of manganese, and those which are unalterable in the air, as chloride of barium, oxalate of ammonia, &c. Ether is preferable to alcohol in these investigations, because, a smaller quantity of water can be detected in it, and because, moreover, the latter liquid dissolves and dishydrates a greater number of salts than ether.

Relying on the insolubility of water in benzine, I have been able to preserve perfectly intact crystals of deliquescent salts, such as those of chloride of calcium and bichloride of copper; efflorescent salts, as sulphate, phosphate and carbonate of soda; and, finally, crystals of salts which oxidise in the air in a certain time, as sulphate of protoxide of iron. To preserve these bodies in benzine, it is sufficient for them to be well dried with filtering paper or with a fine cloth. The crystals left for a long time in contact with benzine, snbmitted for some time to a rather brisk current of air, lose all odor, without undergoing any alteration in their composition or their properties.

ON THE CONCENTRATION OF ALCOHOL.

Carbonate of soda does not concentrate alcohol of 84 degrees. Burnt plaster with difficulty removes water from ordinary alcohol, and, at the temperature of 248° F., necessary for freeing it from the alcohol with which it is impregnated, a portion of the water which it had absorbed is volatilised. Carbonate of potassa may be employed with much advantage in the concentration of weak alcohol; but, beyond 95 degrees, the dishydratation becomes very difficult. Powdered lime, left in contact with alcohol of 84 degrees, does not perceptibly increase its strength.

The only means of rectifying alcohol completely, consists in leaving it in contact with lime in small pieces, for sixteen or twenty hours, and in distilling it afterwards in a chloride of calcium bath, the temperature of which may, towards the end of the operation, be raised to 266° F.

The distillation must not be performed on the open fire, for it takes much longer, and the last portions collected are altered owing to the high temperature which they require.

By means of alcohol of 85·6 we may, by a single rectification over $\frac{4}{5}$ of its weight of lime, obtain 77 per cent. of alcohol of 99·7. By two rectifications, one over $\frac{4}{5}$ of its weight of lime, and the other over its own weight of lime, 70 per cent. of absolute alcohol may be collected.

By means of alcohol of 92·5, a single rectification furnishes 87 per cent. of alcohol between 99·5 and 100 degrees. To obtain 87 per cent. of absolute alcohol, two rectifications are necessary; the first over $\frac{3}{5}$ the second over $\frac{3}{4}$ of its weight of quick lime.

Ordinary ether, left for sixteen hours in contact with its own weight, or half as much again, of quick lime, and then carefully distilled on a sand-bath, gives 93·5 per cent. of anhydrous ether.—*Comptes Rendus*, No. 25, December 22, 1851.

ON THE PHOSPHURET OF TUNGSTEN.

BY MR. WRIGHT.

WHEN pulverulent tungsten is heated in

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a tube and when the vapor of phosphorus is passed into the tube, the two bodies combine, and a grey powder of phosphuret of tungsten is formed. W^3P^2

A compound endowed with very remarkable properties is obtained when a mixture of tungstic acid and phosphoric acid is reduced in a brass crucible. Crude phosphoric acid, fused in an earthen crucible and pulverised, may be employed; it is mixed with tungstic acid in the proportion of 9 of the former to 7 of the latter. In operating on 20 or 30 grammes of tungstic acid, this mixture must be heated for at least an hour to the temperature at which nickel fuses. The operation being completed, the cavity of the crucible is found to be filled with a very beautiful geode hung internally with very thin magnificent crystals sometimes an inch in length. These are six sided prisms, which affect the form of gypsum. They possess a deep steel gray color, and a remarkable metallic lustre. Their density is 5·207. They conduct electricity. In contact with zinc and a dilute acid they disengage hydrogen. In a solution of sulphate of copper, they are covered with metallic copper. They are infusible at the temperature at which manganese fuses.

When calcined in the air they undergo scarcely any alteration. But when they are exposed on red hot charcoal to a current of oxygen gas they burn with great brilliancy, and cover the charcoal with a blue sublimate. They are not attacked by any acid: not even by aqua regia.

According to Mr. Wright's analysis, this phosphuret of tungsten contains W^4P.—*Annalen der Chemie und Pharmacie.*

ANALYSIS OF A MINERAL CONTAINING GOLD, FROM THE PROVINCE OF COQUIMBO, CHILI.

BY F. FIELD, F.C.S.

THE mineral about to be described is very similar to various classes of the grey antimonial copper found in many parts of this republic (Chili), and in numerous other localities. It is very soft, has a greasy texture, and an intense greenish-grey color, somewhat inclining to red; its powder is very red, almost as bright as the native protoxide of copper. It is found in the mine *Altar*, belonging to Senor Urmenata, about thirty leagues from Coquimbo, associated with iron pyrites, blende, galena, and yellow sulphide of copper. The analysis was long and troublesome, owing to the well known difficulties attending the separation of arsenic from antimony, especially when large amounts of sulphur are present. 100 parts gave:

Gold	0·003
Silver	0·075
Copper	36·720
Iron	1·232
Zinc	7·260
Antimony	20·284
Arsenic	3·912
Sulphur	30·350
	99·836

The gold and silver were estimated by cupellation, and afterwards separated by perfectly pure nitric acid; the iron and zinc by carbonate of baryta, &c.

My friend M. Domeyko, Professor of Chemistry in the University of Santiago, makes the following observations upon some specimens of the same mineral I sent him, which he found to vary considerably in the relative amounts of gold and silver.

"The minerals consist of a mixture of galena, iron pyrites, blende, and grey copper (*cuivre gris*); the matrix is amorphous quartz, very nearly pure. The galena is leafy, composed of leaves of different sizes; the blende is nearly black, very ferruginous, the same that generally accompanies the minerals of gold in Chili, as well as in New Granada, and to which Boussingault has given the name of *Marmatite*. The pyrites is amorphous, at times containing a little sulphide of copper. The gold or silver is not perceptible to the sight in any samples of this mineral.

"I have here the results of some assays, made in my laboratory, of some beautiful specimens sent me by Senor Urmenata and yourself:

1°. Grey copper, perfectly pure, gave:

Silver	0·89 per cent.
Gold	0·01 ,,

2°. Mixture of grey copper, galena, and pyrites:

Silver	0·15 per cent.
Gold	0·05 ,,

3°. Mixture of grey copper, galena, blende, and pyrites:

Silver	0·39 per cent.
Gold	0·01 ,,

In conclusion, I may state that I have seen masses of mineral from the mine containing very large pieces of gold evidently alloyed to a great extent with silver. One specimen gave no less than 160 ounces troy of gold per ton of mineral.

The gold, however, exists principally in

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the peculiar mineral, the gray auriferous copper, which occurs in large quantities and of great purity. This mineral, the subject of the above memoir, I believe to be new in mineralogical science.—*Quarterly Journal of the Chemical Society.*

NEW MEANS OF DETECTING THE PRESENCE OF THE SMALLEST TRACES OF IODINE & IODIDES, AND OF SEPARATING THE BROMIDES FROM THE IODINE OR IODIDES WHICH ARE MIXED WITH THEM.

BY M. GRANGE.

In seeking a convenient means of detecting the presence of the iodides in waters used for drinking, I have discovered a process which, I think, will be found serviceable.

The presence of iodide of potassium may easily be detected in any liquid not colored, containing about five millionths of its weight of this iodide; it is sufficient to pour into a test glass the liquid to be tested, to add to it a few drops of a solution of starch, and to pass into it a few bubbles of hyponitric acid: the reaction is immediate, the liquor becomes of a slightly violet pale rose color, for solutions containing not more than five millionths of iodide; the liquor is colored of a bright blue when a liquid containing one hundred-thousandth of its weight of iodide is tested.

The presence of alkaline salts does not modify the phenomena; as soon as the liquor becomes acid, the reaction is produced.

The presence of salts of lime and especially of chloride of calcium and sulphate of lime slightly modifies the reaction: in the latter case, the iodide of starch takes, when very small quantities of iodine are present, a more violet and paler tint.

When the reaction is not very clear, the liquor must be left to itself for a few minutes; a slight deposit of violet rose colored iodide of starch is formed, which indicates the presence of iodine.

The liquors on which these experiments were made were prepared with the greatest care, and we mixed with them together or separately all the salts which are ordinarily met with in water.

Liquors containing a hundred-thousandth of iodide, give a very clear reaction (bright blue).

Liquors containing five millionths of iodide are colored of a violet red.

Liquors containing one millionth and less do not give a precise result.

In this case, I had recourse to the method indicated by M. Rabourdin,—the use of chloroform. After having passed a current of hyponitric acid into the liquid to be tested, or nitric acid, containing in solution a large quantity of hyponitric acid, a small quantity of iodide of potassium is added, which becomes of a rose color when, by agitating the liquor, the chloroform has been enabled to dissolve the greater part of the iodine liberated.

The chloroform is colored rose color and violet when a small quantity of iodine is present, and orange when it contains a small quantity of bromine. When a powerful acid is used, such as nitric acid or ordinary sulphuric acid, the bromides are partly decomposed and color the chloroform; the coloration does not then admit of a very small quantity of iodine being detected; in this case a few drops of a solution of potassa are added to the chloroform, the chloroform resumes its natural color, the liquor is decanted, and we obtain with the solution of starch, the characteristic reaction by means of a few bubbles of hyponitric acid as soon as the liquor becomes acid.

It is very easy by this means to recognise the presence of iodide of potassium in water containing only one ten-millionth of its weight; I have been able thus to ascertain, directly, and without evaporation, the presence of iodide of potassium or sodium in running waters, even in that of the Seine, by washing with a small quantity of chloroform a litre of acidulated water.

By the action of hyponitric acid it is easy to separate, from solutions which contain bromides, the smallest traces of iodide whilst the iodides are alone decomposed.

In the same manner as hyponitric acid detects iodine, the iodide of potassium detects the presence of the smallest traces of nitrite by means of the solution of starch, and a few drops of water acidulated with hydrochloric acid.

Whenever we have to test organic matters or liquors colored by organic matters, these matters must be destroyed by incineration with a small quantity of potassa; the iodide of potassium is separated by washing the ashes.

When the liquor, after the evaporation of a certain quantity of water, does not contain at least one-fourth of a milligramme of iodine, and this latter case is very rare, estimation with the balance is impossible; we are obliged to compare the results together, and it must be owned, in the comparison of a great quantity of drinkable water, the results obtained can be regarded

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as sufficient approximations only when the experiments are made by the same person and by employing the most delicate precautions.

By the means which I have just described I have analysed a great number of drinkable waters; but these analyses are not yet sufficiently numerous for their results to be submitted to the attention of the Academy. I should say, however, that they confirm in general the facts noticed by M. Chatin, namely: the rarity of iodine in the waters of snow and of rivulets at great heights and its comparative abundance in the rivers of our great hydrographic basins, results which do not contradict the facts which I have submitted to the Academy.—*Comptes Rendus*, No. 22, 1st Dec., 1851.

NOTE ON THE EQUIVALENT OF PHOSPHORUS.

BY M. JACQUELAIN.

PROTO-CHLORIDE of phosphorus was prepared by means of well-dried chlorine and phosphorus. The chlorine was produced in an apparatus without corks, without caoutchouc, and all of whose parts were of glass. As to the phosphorus, it was previously fused in an atmosphere of carbonic acid, dried first by sulphuric and afterwards by phosphoric acid.

This protochloride of phosphorus, obtained in presence of an excess of phosphorus, was distilled a first time, and then put in contact with anhydrous phosphorus for three days, agitating very frequently, and finally distilled twice at the temperature of 185° F. in the exterior bath.

Experiment I.—1·213gr. require 623·5cc. nitrate of silver=3·1175gr. Ag. = 1·020gr. Cl. Very slow decomposition by water, addition of a little nitric acid, then employment of nitrate of silver.

Experiment II.—1·409gr. require 723 cubic centimetres of nitrate of silver = 3·615gr. Ag=1·1837Cl. Very slow decomposition by water, neutralisation by carbonate of soda, concentration to dryness in a sand-bath, supersaturation by a little nitric acid, the liquor then tested with nitrate of silver.

Experiment III.—1·756gr. give with 3·8 gr. PbO — 4·693gr. phosphate = 0·893gr. PhO.

	Per cent. of chloride.
First analysis.....	84·08Cl.
Second analysis.....	84·00Cl.
Mean	84·04Cl.
By the difference	15·96Ph.
Third analysis	50·85PhO^5.

Supposing the product analysed to have the composition Cl^3Ph, and phosphoric acid being PhO^5, we arrive at the following cyphers:—

84·04 : 15·96 : : 442·6 × 3 : x = 252·16.
Chlorine. Phos. Cl. Ph.

34·89 : 15·96 : : 500 : x = 228·71.
Oxygen. Phos. O Ph.

The protochloride of phosphorus therefore contained an excess of chlorine.

If we set out from the known equivalents of phosphorus and chlorine for controling the composition, and, consequently, the formula of the protochloride of phosphorus analysed above, we arrive at the following contradictions, since

892·5 : 392 : : 0·893 : x 0·3927
PhO^5. Ph. Phosphoric acid. Phosphorus.

whence

Protochloride.	Protochloride.
1·7560gr.	1·7560gr.
Ph. by calculation.	Cl. by difference.
—0·3927gr.	1·4751gr.

Cl. by difference.	Ph. by difference.
1·3633gr.	0.2809
Relation of equivalents.	Relation of equivalents.
$\frac{392·7}{392·5}$ = 1	$\frac{280·9}{392·5}$ = 0·7156 = 1
$\frac{1363·3}{442·6}$ = 3·08	$\frac{1475·1}{442·6}$ = 3·3328 = 4·6

The foregoing protochloride of phosphorus was put in contact with the amalgam of tin for twelve hours, and then distilled at 185° F. of the outer bath.

In this investigation, all the estimations of the phosphorus were made by slowly decomposing the chloride with water, and directing into it a current of pure chlorine at 158° F. for ten hours. It was then concentrated at 194° F., so as to expel all the hydrochloric acid formed, and then neutralised by means of a known excess of hydrated oxide of lead: finally, it was very moderately calcined between 572° F. and 752° F.

Experiment IV.—0·5005gr. require 235 cubic centimetres of nitrate of silver = 1·175gr. Ag. = 0·3847Cl.

Experiment V.—1·4905gr. give with 7·114 PbO 7·966gr. phosphate = 0·852gr. PhO^5.

	In 100 of chlorine.
First analysis.....	76·86Cl.
By the difference	23·14Ph.
Second analysis.....	57·16PhO^5.

Reasoning as before, we have:

76·86 : 23·14 : : 442·6 × 3 : x = 399·7
Chlorine. Phosphorus. Ph.

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34·02 : 23·14 : : 500 : x=340·07
Oxygen. Phosphorus. O. Ph.

Thus, the protochloride of phosphorus, in contact with the alloy, had lost too much chlorine and contained an excess of phosphorus.

By submitting this protochloride to the check we have already spoken of in experiments 1, 2 and 3, we arrive also at improbable equivalent proportions:

Protochloride.	Protochloride.
1·4905gr.	1·4905gr.
Ph calculated.	Cl by experiment.
—0·3746gr.	— 1·1354gr.
Cl by difference.	Ph by difference.
1·1159gr.	0·3551gr.

whence

Ph..... 1	Ph..... 1
Cl ..... 2·64	Cl..... 2·83

Protochloride of experiments 1, 2 and 3, distilled a first time on anhydrous phosphorus, then rectified twice at 190° F. of the outer bath.

Experiment VI.—0·7435gr. require 355 cubic centimetres of nitrate of silver= 1·775 Ag.=0·581 Cl.

Experiment VII.—0·5410gr. require 258 cubic centimetres of nitrate of silver=1·290 gr. Ag.=0·4224 Cl., the direct estimation of chlorine.

Experiment VIII.—1·3400 gr. require 638cc·5 of nitrate of silver=3·1925 Ag.= 1·0454Cl., the estimation by the medium of carbonate of soda.

Experiment IX.—1·9625gr. give with 7·12 PbO—8·146 phosphate=1·026 PhO^5.

	In 100 of chlorine.
First analysis	78·14Cl.
Second analysis	78·07Cl.
Third analysis	78·01Cl.
Mean.....	78 07Cl.
By the difference.....	21·93Ph.
Fourth analysis	52·28PhO^5.

whence

78·07 : 21·93 : : 442·6×3 : x=372·98
Chlorine. Phos. Cl. Ph.
30·35 21·93 500 : x=361·28
Oxygen. Phos. O. Ph.

Checking the formula by the known equivalents of phosphorus and chlorine, we have:

Protochloride.	Protochloride.
1·9625gr.....	1·9625gr.
Ph calculated.	Cl by experiment.
—0·4512gr.....	— 1·5313gr.
Cl. by difference.	Ph. by difference.
1·5113gr.	0·4312gr.

which leads to

Ph..... 1	Ph..... 1
Cl 2.972	Cl ..... 3·15

These results render the number 372·98 very probable for the equivalent of phosphorus.

Phosphorus was weighed which had been kept for three hours in fusion in an atmosphere of carbonic acid and dried with anhydrous phosphoric acid. It was submitted for eight days to the action of a very slow current of pure chlorine in the presence of water heated to 131° F., the chlorine being always in excess.

After evaporating at 192° F. in a sand-bath, until all the chlorine as well as the hydrochloric acid was expelled, it was saturated by a known weight of hydrated oxide of lead.

After desiccation and slight calcination, it was weighed until the weight of the phosphate was constant.

Experiment X.	gr.
Dry phosphorus	0.5685
Phosphoric acid and oxide of lead	8·4450
Oxide of lead	7·1140
Phosphoric acid	1·331
Consequently fixed oxygen	0·7625

whence

0·7625 : 05685 : : 500 : x=372·77
Oxygen. Phosphorus. O. Ph.

This last experiment confirms analyses 6, 7, 8 and 9, and authorises me, for the moment, in thinking that the equivalent of phosphorus should be represented by the mean of the two numbers 372·98 and 372·77, that is to say, 372·875, a lower cypher by 28 units than the number, 400, adopted by M. Pelouze, according to his experiments. —*Comptes Rendus*, No. 25, Dec. 22, 1851.

PRESENCE OF SUGAR IN THE URINE.

BY SENOR ALVARO REYNOSO.

In my previous notes, I have endeavored to prove the connection which exists between the respiration and the presence of sugar in the urine; so that any derangement in the performance of this function occasions the passage of sugar into the urine.

I have spoken of the hyposthenisant treatment which preserves a portion of the blood from the action of oxygen. I will add to the examples already given that, in dogs subjected to treatment with arsenic, lead and sulphate of iron, and in patients treated with carbonate of iron, sugar is always found in the urine.

I now enter upon the second part of my researches. When the respiration is disturbed, whether by disease of the lungs themselves, or by the effect of another affce-

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tion which deranges its performance, there will be sugar in the urine.

I have proved its presence also in the urine of tuberculous persons, and the quantity was so much the greater as the disease was more advanced, and as the inflammatory symptoms were more intense.

In pleurisy, and chronic bronchitis, there is also sugar in the urine. It is the same in asthma.

It is also found in cases of hysteria and epilepsy.

In cholera there should be sugar in the urine; for, according to M. Rayer, in this disease, the lungs cause the air to undergo little or no change. It is to be desired that the physicians who are in a situation to study these diseases, will seek for the presence of sugar in the urine of the patients. —*Comptes Rendus, No.* 22, *Dec.* 1, 1851.

INTRODUCTION TO THE STUDY OF CHEMISTRY.

NO. VII.

IODINE. (CONTINUED.)

THE COMPOUNDS OF IODINE WITH OXYGEN AND CHLORINE.

There are four definite combinations of iodine with oxygen:—

		Equiv.
Iodoso-iodic acid or oxide of iodine	I^5O^{19}	632· + 152=784
Iodous acid	IO^4	126·4 + 32=158·4
Iodic acid	IO^5	126·4 + 40=166·4
Periodic acid...	IO^7	126·4 + 56=182·4

The first two bodies are of only very trifling importance; they are obtained by the action of sulphuric and nitric acids on iodine and iodic acid. When finely-divided iodine is acted on by concentrated nitric acid, a yellow matter is formed, which is a compound of nitric and iodous acids.

Oxide of iodine was discovered by Lementini, in endeavoring to effect the direct combination of iodine with oxygen. A bladder containing oxygen is attached to a copper tube, arranged so as to be heated by means of a lamp or a small charcoal fire; the other end of this copper tube enters the tubulure of a tubulated retort, containing iodine: the oxygen is driven through the heated tube into the vapor and on the hot iodine; a thick, oily yellow liquid distils over, possessing a very disagreeable odor and taste. This is the oxide of iodine. It is volatile in the air, and produces amber-colored solutions in alcohol and water. It causes phosphorus and potassium to inflame. It turns blue litmus green. An alkali renders its solution colorless. Its composition is not accurately known.

IODOUS ACID. IO^4 158.

PREPARATION.—When an excess of oxygen and a high temperature are used in the foregoing process, some iodous acid is produced. The best mode of obtaining it consists in rapidly applying heat to a mixture of one part of iodine and three parts of chlorate of potassa in a retort; a dense liquid distils, which must be collected in a receiver surrounded with a frigorific mixture.

PROPERTIES.—Its taste is pungent and its odor extremely disagreeable. Its specific gravity is higher than that of water. It reddens litmus, and forms with water a yellow solution: it volatilises slowly in the air, and rapidly at 112° F. Sulphur decomposes it, with a slight evolution of heat, and liberation of violet vapors; it is also decomposed by sulphurous acid. It exerts no action on carbon. Potassium and phosphorus are instantly inflamed by it. Iodine is soluble in it. Its composition has not been determined with certainty. Wöhler's experiments tend to show that it contains chlorine when obtained by means of chlorate of potassa. Mitscherlich obtained, by the spontaneous evaporation of a solution of iodine in a weak solution of soda, prismatic crystals, which were converted by the action of hot water into a mixture of iodate of soda and iodide of sodium, which he regards as *iodite* of soda.

IODIC ACID. IO^5. 166.

PREPARATION.—This acid cannot be formed by the direct action of oxygen on iodine. It may be very easily prepared by boiling iodine in concentrated nitric acid and then driving off the excess of acid by heat; the iodic acid remains as a deliquescent crystalline mass. With a large quantity of iodine this process would occupy a very considerable time; the following process, although more complicated, is quicker:—Iodine is diffused in water, and a stream of chlorine is driven into it until all the iodine is dissolved: the acid liquor thus produced is neutralised by means of carbonate of soda, which causes the precipitation of a portion of the iodine; the current of chlorine is again passed in until the iodine again disappears, when more carbonate of soda is added: this process is repeated until carbonate of soda no longer causes the precipitation of the iodine: the solution now contains iodate of soda and chloride of sodium, produced by the decomposition of the chloride of iodine formed in the first

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nstance. Thus, 5Cl and I produce ICl^5, which, with 6SoO, give 5SoCl and SoO + IO^5. A solution of a salt of baryta is then added, and iodate of baryta is precipitated: this may be decomposed by boiling it with one-fourth of its weight of sulphuric acid and 1½ times its weight of water: sulphate of baryta separates by precipitation, and the iodic acid which remains in solution may be carefully evaporated to dryness. Iodic acid may also be prepared by the action of iodine on the peroxide of chlorine: the iodine is introduced into a small flask, and the peroxide of chlorine is disengaged upon it from a mixture of sulphuric acid and chlorate of potassa. (See The Chemist for December 1851, page 166): or 100 parts of chlorate of potassa and 400 parts of hydrochloric acid of specific gravity 1·105 may be introduced into a small retort; a small globular receiver is connected with the retort, and a bent tube passes from the receiver to the bottom of a small flask containing about 50 parts of iodine: carefully apply heat to the retort by means of a lamp; peroxide of chlorine will be disengaged, and will be decomposed and absorbed by the iodine. The resulting compound consists of chloride of iodine and iodic acid; the former may be separated by a moderate heat, leaving the iodic acid as a white deliquescent, semitransparent, sour, and inodorous body, very soluble in water: its specific gravity exceeds 2. This acid may likewise be precipitated by slowly adding an excess of alcohol or of ether to a strong solution of the perchloride of iodine in water, Millon recommends the following as the best process of preparing iodic acid:—80 parts of iodine, 75 parts of chlorate of potassa, 1 part of nitric acid and 400 parts of water are mixed and digested in a glass flask of sufficient size, and boiled until the chlorine begins to be disengaged in abundance, when the heat is removed. The iodine entirely disappears, and the liquor contains iodic acid and chloride of potassium. By the addition of chloride of barium iodate of baryta is precipitated; this is washed and decomposed with the necessary proportion of sulphuric acid: the sulphate of baryta is separated, and the iodic acid crystallised from the solution.

PROPERTIES.—Iodic acid is very soluble in water; its aqueous solution first reddens and then destroys vegetable blues; when this solution is concentrated by evaporation, it yields a pasty mass, which is *hydrated* iodic acid, IO^5, HO and which may be crystallised in hexagonal laminæ, the water of which may be driven off by a careful application of a higher degree of heat. It fuses at about 500° F., and is converted into oxygen and iodine. According to Millon, there is also a hydrate=$3IO^5$, HO, which is almost insoluble in alcohol; the anhydrous and the above-mentioned hydrated acid are soluble in about two parts of that liquid. Iodic acid acts as powerfully as nitric acid in oxidising the metals, and forms with the oxides salts called iodates. Nitric, sulphuric, phosphoric and boracic acids, dropped into a hot solution of this acid, form yellowish crystals, consisting of the two acids. When it is mixed with a solution of sulphurous acid, water and sulphuric acid are formed, and iodine is liberated; with sulphuretted hydrogen, it gives a mixture of water, sulphur and iodine; an excess of sulphuretted hydrogen finally converts the iodic acid into iodide of hydrogen. Iodic acid may be detected by these means, as also by its peculiar action on morphia. It is decomposed by hydrochloric and oxalic acids. Mixed with charcoal, sulphur and some other combustible matters, it forms compounds which deflagrate when heated; its compounds, like the chlorates, deflagrate when thrown on red hot charcoal. Its solution is decomposed by several organic matters, as morphia, narcotine, and pyrogallic acid; saliva decomposes it, owing to the sulphocyanide which it contains. This acid is composed, according to Gay-Lussac, of:—

			Per cent.
Iodine	1 . .	126	75·9
Oxygen	5 . .	40	24·1
Iodic acid	1	166	100·0

The elements of iodic acid are combined vapor of iodine to five volumes of oxygen. in the proportion of two volumes of the

IODATES.—The iodates are the compounds of iodic acid and the oxides. They are represented by the general formula MO + IO^5 or M + IO^6. Heat converts them into iodides or oxides. They bear a strong resemblance to the chlorates.

PERIODIC ACID. IO^7 182.

PREPARATION.—When a solution of iodate of soda, mixed with a considerable excess of caustic soda, is saturated with chlorine, a quantity of the soda is decomposed; the sodium of the soda decomposed combines with the chlorine, and its oxygen is added to the iodic acid, converting it into periodic acid, which combines with two equivalents of soda. Thus, 2Cl acting on 3 SoO and IO^5 + SoO, produces 2 SOCl and IO7 + 2SoO. The addition of nitrate of silver to the solution

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of this salt gives rise to the formation of the basic periodate of silver, which, on being dissolved in nitric acid, forms yellow crystals of neutral periodate of silver. When put into contact with water, these crystals, half of the periodic acid precipitating with the whole of the nitrate of silver, as the insoluble basic salt, and the other half remaining in solution may be obtained by evaporation as a white, crystallised mass, the hydrated acid. Another process consists in dissolving periodate of soda in the smallest quantity of warm dilute nitric acid, and adding a solution of nitrate of lead; periodate of lead is precipitated, and may be decomposed by a sufficient but not an excessive quantity of sulphuric acid; sulphate of lead is precipitated and periodic acid remains in solution, which should be decanted from the insoluble sulphate, and evaporated to crystallisation.

Periodic acid is more stable than iodic acid; it requires a higher temperature for its decomposition.

Its composition and equivalent numbers are:—

			Per cent.
Iodine	1	126	69
Oxygen	7	56	31
Periodic acid	1	182	100

COMPOUNDS OF IODINE WITH CHLORINE.

According to Sir Robert Kane, there are three compounds of iodine with chlorine; ICl, ICl^3 and ICl^5.

PROTOCHLORIDE OF CHLORINE. ICl. 162.

PREPARATION.—Chlorine gas, when driven into a vessel containing iodine, is rapidly absorbed, a compound is formed which is brown when iodine is in excess, colorless when saturated, and yellow when chlorine is in excess. The first of these bodies is regarded as the protochloride; it is a red brown liquid, possessing the united odor of chlorine and iodine; it irritates the eyes; it has a sour, astringent and pungent taste; it is hygrometric, stains the skin yellow, and bleaches litmus and indigo; it does not form a blue compound with starch. When it is moderately heated, the perchloride is evolved, and iodine is left behind: solutions of sulphurous acid and sulphuretted hydrogen separate iodine from it. It forms chlorides, iodates and free iodine with solutions of potassa and soda; an excess of alkali converts the free iodine into iodate and iodide. It forms with ammonia hydrochlorate of ammonia, and iodide of nitrogen, which is precipitated. An aqueous solution of protiodide of chlorine is obtained by passing a small portion of chlorine into water holding in suspension an excess of iodine: the chloride is removed by agitation with ether, and may be separated by driving off the ether. According to Sir R. Kane's experiments, this chloride of iodine is composed of:—

			Per cent.	Kane.
Iodine	1	126	77·7	76·94
Chlorine	1	36	22·3	23·06
Protochloride of iodine	1	162	100·0	100·00

PERCHLORIDE OF CHLORINE. ICl^3. 234

PREPARATION.—This compound is prepared by driving dry chlorine in considerable excess over dry iodine, under the influence of a very gentle heat: its color is yellow; after fusion, it forms an acicular crystal. It resembles the protochloride in its action on other bodies. It enters into fusion between 70 and 80° F, giving out chlorine, which is reabsorbed on cooling. Ether does not remove it from its solution in water. With a solution of potassa, it furnishes chloride and iodate, iodine being separated when the alkali is not in excess. Sulphuric acid precipitates it from its aqueous solution, and, if added by degrees in a cold vessel yields first a white caseous, and afterwards a yellow precipitate, soluble when the liquor is heated, but separated again on cooling. The composition of perchloride of iodine, according to Kane, is—

			Per cent.	Kane.
Iodine	1	126	53·84	54·34
Chlorine	3	108	46·16	45·66
Perchloride of iodine	1	234	100·00	100·00

IV. BROMINE. Br. 78

This simple body, which is intermediate in almost all chemical properties to iodine and chlorine, was discovered in the year 1826, by M. Balard. It was first obtained from the uncrystallisable residue of sea-water called bittern. It exists in association with chlorine and iodine in sea-water, many varieties of sea-weed, and in some of the brine springs appertaining to deposits of rocksalt in the earth. It has also been found by M. Mène, in gas-liquor (see THE CHEMIST, New Series, Vol. II, 1850-51, page 17). When a current of chlorine is passed through the mother liquor, called bittern, the bromine is liberated and communicates a yellow

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color to the liquid. On agitating this liquid with sulphuric ether, the bromine is completely abstracted by it and a solution of bromine in ether, of a fine hyacinth red color, is obtained. When this ethereal solution is subjected to the action of potassa, a mixture of bromide of potassium and bromate of potassa is formed: by fusion, this mixture evolves oxygen, and pure bromide of potassium remains. This is mixed with sulphuric acid and peroxide of manganese, and, just as in the preparation of chlorine and iodine, the bromine is liberated and may be distilled over. The bromine must be condensed with great care, and received in water, to the bottom of which it falls; if necessary, it is afterwards freed from water by distillation over chloride of calcium. If the matter from which the bromine is to be obtained contains iodine, it must be separated in the form of iodide of copper by means of a solution of sulphate of copper. [For a new process having this object see the paper by M. Figuier, the first half of which is given in this No.]

It is probable that bromine exists in sea-water in the state of bromide of magnesium; its proportion is extremely small. 100 pounds of sea-water, taken at Trieste, furnished only 5 grains of bromide of sodium=3·3 grains of bromine; in this water it is not accompanied by iodine, as is the case according to Hermbstadt in the water of the Dead Sea; Messrs. T. J. and W. Herapath found in the water of the Dead Sea only very faint and doubtful traces of iodine (see THE CHEMIST, Vol. I., page 242); M. Marchand detected none (THE CHEMIST, Vol. I., page 60.) M. Figuier regards the bromine of the Mediterranean as existing in the state of bromide of sodium, unaccompanied by bromide of magnesium.

The presence of bromine in water is demonstrated by evaporating it in order to separate its ordinary crystallisable contents, reducing it to a small volume, and dropping into it a strong solution of chlorine; when iodine is not present, which may be proved by the starch test, bromine is indicated by the manifestation of a yellow coloration. By this means, it has been shown to exist in some salt springs, in the ashes of sea-plants, and of sea animals. The saline springs of Theodorsthal, near Kreutznach, in Germany, contain the largest quantity of bromine; they are, indeed, the sources from which it is chiefly obtained as an article of commerce.

PROPERTIES—Bromine is liquid at ordinary temperatures; it solidifies at 4° F.; it is of a deep red brown by transmitted, and black by reflected light; it has a strong, disagreeable odor, resembling that of oxide of chlorine, whence its name; its specific gravity is 2·97; it is very volatile, and boils at 116° F.; even at common temperatures, it evolves abundant fumes of the same orange red color as those of nitrous acid; its vapor has the specific gravity, compared with atmospheric air, of 5·393. It is a non-conductor of electricity. Transmission through red hot tubes produces no change in it. It must be kept under water, or the quantity of vapor which it would form might burst the vessel containing it. It is sparingly soluble in water (1 part in 23, according to Löwig), forming a solution possessing a brown color, and a harsh but not acid taste; the bromine escapes from this solution by exposure, and rapidly if heat be applied; when kept for a long time, particularly when exposed to the action of light, it becomes sour from the formation of hydrobromic acid. It is abundantly soluble in alcohol and ether. A lighted taper immersed in its vapor is extinguished, but not at once; it burns for a moment with a green flame and much smoke. A hydrate, of definite composition, is formed under certain circumstances; Löwig obtained it by exposing bromine with a small quantity of water to a temperature of 32° F.; it is then deposited in red octohedral crystals, which contain 10 equivalents of water and are permanent at 50°F; at a temperature exceeding this, this hydrate is decomposed into liquid bromine and its aqueous solution. Hydrate of bromine may also be formed by passing vapor of bromine through a moistened tube cooled to near the freezing point of water. Bromine bleaches vegetable colors; it gives an orange tint to a solution of starch. Phosphorus, tin and antimony burn in it; potassium combines with it with explosion. It exerts on alkaline solutions an action analogous to that of chlorine and iodine. It communicates a yellow color to the skin; it acts energetically on most organic substances; it is destructive of animal life; one drop on the beak of a bird kills it instantly. Its equivalent is 78, deduced from Berzelius's analysis of the bromide of silver. 100 cubic inches weigh about 107 grains. Bromide of sodium and the alcoholic solution of bromine are sometimes used in medicine, as are the aqueous solution of bromine (Pourche) and the bromides of potassium, iron, barium, calcium and mercury. Its therapeutical action is

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similar to that of iodine, and it is used in the same cases. To the presence of the bromides, doubtless, the medicinal powers of the waters containing it must be attributed.

COMPOUNDS OF BROMINE AND OXYGEN.

BROMOUS ACID Br O 16

Gay-Lussac asserts that he obtained bromous acid in the gaseous state by a process similar to that which he adopted for forming chlorous acid.

BROMIC ACID. BrO^5 118

This acid is formed by the decomposition of bromate of baryta by sulphuric acid; the sulphate of baryta is precipitated, and bromic acid remains in solution; it may be concentrated by slow evaporation; at a high temperature it undergoes partial decomposition; it cannot be obtained in the anhydrous state. It has not been obtained in the solid state; it is colorless, sour, and odorless; it first reddens and then bleaches blue litmus. Concentrated sulphuric acid partially decomposes it; nitric acid does not; sulphurous, phosphorous, hydriodic and hydrochloric acids and sulphuretted hydrogen decompose it. Its composition is—

			per cent.	Balard.
Bromine . .	1	78	66·1	64·69
Oxygen . .	5	40	33·9	35·31
Bromic acid .	1	118	100·0	100·00

The formation of perbromic acid BrO^7 has not yet been effected.

The bromates are represented by the general formula $MO + BrO^5$ or $M + BrO^6$; heat produces the same results with these salts as with the iodates. With combustible matters, they deflagrate like the chlorates.

CHLORINE AND BROMINE.

By driving a stream of chlorine into bromine, and condensing the vapors produced at a low temperature, a reddish yellow liquid is formed, which possesses a penetrating odor and disagreeable taste. It is very fluid and volatile; its vapor is yellow, it is soluble in water and the solution bleaches vegetable colors; it is probable, therefore, that it does not decompose water. By cooling this aqueous solution, crystals of the hydrated chloride of bromine are deposited, exposure to the sun's rays decomposes it into hydrochloric and hydrobromic acids. Chlorine destroys most of the compounds of bromine; consequently, it is very useful as a test of its presence.

IODINE AND BROMINE.

It is probable that these two simple substances combine in two proportions, the compounds have not, however, yet been analysed. In certain proportions (probably 1 equivalent of each) a solid substance is formed, which, on being heated evolves reddish brown vapors, which readily condense into arborescent crystals. These are soluble in a further quantity of bromine, producing a very dark liquid, which is soluble in water, bleaches, and produces with the alkalis iodides and bromides.

V. FLUORINE, F. 19.

Fluorine has not yet been isolated, for, its combining powers are so energetic that as soon as it is thrown out of combination with one substance, it enters into combination with another. Its existence, consequently, has been proved only by analogy, but recent experiments have done much to establish its distinct identity. "The most successful experiments made for examining it in its isolated form are due to two talented Irish Chemists, the Messrs. Knox. The only substances on which fluorine is incapable of acting, being such as are already fully saturated with it, Messrs. Knox had constructed vessels of fluor-spar (fluoride of calcium) which were filled with pure, dry, chlorine gas. Into these vessels was then introduced fluoride of mercury, and the whole carefully warmed. The chlorine decomposed the fluoride of mercury, forming chloride of mercury, and the fluorine was disengaged: HgF and Cl giving HgCl and F. There was in this way obtained a colorless gas which acted with violence on the fragments of metallic foil, that by means of a very ingenious arrangement were submitted to its action. The small quantity of material on which the experiments were conducted did not allow of the metallic compounds so formed being analysed; and the only doubt that can exist of the isolation of fluorine in this process, is that, according as it was liberated, it may have been combined with the excess of chlorine present, and that the colorless gas may have been chloride of fluorine and not the mere fluorine itself."—(Sir R. KANE'S *Elements of Chemistry.*) Berzelius regards its equivalent as 18·75. It has not been found in many mineral substances. One of these, fluor-spar, is, however, very abundant; it is a compound of fluorine and calcium—fluoride of calcium. It has been found in bones and in the enamel of the teeth. Dr. Wilson (see THE CHEMIST, New Series, Vol. I., 1849-50, page 53, and Vol.

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II, page 13) has detected it in sea-water, blood, and milk. No compound of this body with oxygen or chlorine has hitherto been satisfactorily obtained. Dr. Leeson states that fluoride of iodine may be formed by passing the gas generated by 1 part of peroxide of manganese, 3 parts of pure fluor-spar and six of concentrated sulphuric acid, mixed in a leaden vessel, into water containing iodine in diffusion: crystalline scales having great resemblance to iodide of lead are deposited. Fluoride of bromine produced in the same way does not assume the crystalline form.

The specific gravity of gaseous fluorine, deduced from the analogy of its compounds to those of chlorine, is 1280.

(To be continued Monthly.)

ON A CLASS OF AMMONIACAL COMPOUNDS OF COBALT.

BY FREDERIC CLAUDET, ESQ.

When an excess of ammonia is added to a solution of protochloride of cobalt mixed with four times its weight of chloride of ammonium, the solution becomes of a dark brown color without any appearance of a precipitate. In this state, the solution rapidly absorbs oxygen from the air; and on frequently agitating a bottle half-filled with it, removing the stopper from time to time to renew the air, the absorption is much facilitated, and is complete in the space of three or four days, the color of the liquid changing at the same time from dark brown to an intense violet-red. If the air be replaced in this experiment by pure oxygen gas, the oxidation is still more rapid, and may be completed (if the quantity of solution be not too large) without requiring the removal of the stopper. By boiling this oxidized ammoniacal solution, strongly acidified with hydrochloric acid, a heavy crimson powder is deposited. A slight effervescence takes place at the same time, due to the evolution of a certain quantity of oxygen, and the liquid becomes nearly colorless, owing to the precipitation of the whole of the cobalt in the form of the new compound. The liquid when cold is drawn off from the red powder, which is washed several times by decantation with distilled water, thrown on a filter, and allowed to dry in a warm chamber. The precipitated powder thus obtained is nearly pure. Before examination it is, however, necessary that it should be crystallized. The powder for this purpose is dissolved in boiling water to which a few drops of hydrochloric acid have been added; and on cooling, the salt is deposited in the form of regular octohedrons, small, sparkling, and of a ruby-red color, very much resembling small crystals of chrome-alum.

This salt, which is an intense coloring matter, is sparingly soluble in cold water, 1 part requiring at 60° F. 244 parts of water; it is soluble to a much larger extent in water at the boiling point, to which it imparts a very deep red color; it is however slightly decomposed, and altogether so on boiling the solution; but this may be prevented by keeping the solution slightly acid with hydrochloric acid.

Hydrochloric acid, and saturated solutions of chloride of ammonium and sodium, completely precipitate the new salt from its solution; alcohol acts in the same way. The salt is not decomposed by boiling hydrochloric acid. Sulphuric acid evolves hydrochloric acid, a corresponding sulphuric salt being formed; the reaction, however, is not complete, for at the end of the operation, chlorine comes off from some decomposition. Nitric acid partially transforms the salt into the nitrate of the base. Potash and soda decompose the solution of the salt, a hydrated peroxide of cobalt being thrown down and ammonia evolved in considerable quantity. Hydrate of baryta decomposes the salt in the same way with the aid of heat, but not in the cold. Carbonate of potash or soda has no effect. Yellow prussiate of potash gives with a solution of the salt a dirty brown precipitate, red prussiate none; but on standing, bright yellow needles crystallize from the solution.

Sulphuretted hydrogen precipitates the whole of the cobalt as a bisulphide of that metal, ammonia being liberated at the same time. The analysis of three different preparations of this sulphide gave—

	Calculated.		Found.		
			I.	II.	III.
Cobalt .	29·5	47·96	48·9	49·5	48·2
Sulphur .	32·0	52·04	51·1	50·5	51·8
	61·5	100·00			

On boiling a solution of the new salt, it is decomposed into ammonia, which escapes, and a superior hydrated oxide of cobalt, containing a certain amount of a nitride of cobalt which is precipitated, nothing but chloride of ammonium remaining in solution. The composition of the precipitated oxide of cobalt appears to be Co^3O^4+3HO.

Dried in the air, the salt contains no water of crystallization, neither does it contain oxygen. When heated to low redness

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in a glass tube, a large quantity of ammonia is disengaged, a certain quantity of chloride of ammonium sublimed, and a residue of common protochloride of cobalt remains. In this reaction, no moisture is produced, which would necessarily be formed if any oxygen existed in the compound.

The analysis of this salt was effected in the following manner. The chlorine was estimated from the chloride of silver, obtained on boiling the solution with an excess of nitrate of silver and nitric acid. In the cold, the precipitation by nitrate of silver is not complete. The cobalt was determined by reducing a certain quantity of the substance introduced into a tube with a bulb, by pure hydrogen and heat. The nitrogen was estimated as ammonia, by distilling the salt with caustic soda, receiving the ammonia into hydrochloric acid, and determining the weight of the double chloride of platinum and ammonium. The ammonia was also obtained by heating the salt with soda-lime, according to the method of Will and Varrentrapp. This last process, however, gave less accurate results, a deficiency of about 1 per cent. in the nitrogen being found. The hydrogen was determined by combustion of the salt with a mixture of oxide of copper and chromate of lead, and copper turnings.

The number of equivalents of chlorine, cobalt, nitrogen and hydrogen, thus determined, are 3Cl, 2Co, 5N and 16H :—

	Calculated.		Found.		
			I.	II.	III.
3Cl=	106·5	42·35	42·22	42·38	42·25
2Co=	59·0	23·46	23·63	23·50	23·66
5N=	70·0	27 83	27·20	27·79	
16H=	16·0	6·36	6·31	6·34	6·46
	251·5	100·00			

The salt containing a large quantity of chlorine, it might be expected that the volatilization of minute quantities of chloride of copper or chloride of lead in the combustion should give an increase in the results for the hydrogen, one equivalent of the latter making a difference only of 0·37 per cent. The results obtained, however, agree pretty well together; and as they do not differ much from the calculated numbers, it is highly probable that sixteen is the true number of equivalents of hydrogen in the salt: and this view is further confirmed by the manner in which the salt is decomposed by heat. A combustion-tube about two feet long was closed at one end and bent at right angles within about half an inch of the closed end, so as to form a kind of retort. A certain quantity of the salt was rubbed into a paste with a little water and rolled up into the size of a pea. When quite dry, this was dropped into the tube and made to enter the small retort; mercury was then gently poured into the tube, which was gradually filled and then inverted in a mercurial trough. The mercury descended about a quarter of an inch in the tube, on account of a small quantity of air which remained in that portion containing the salt. The retort part of the tube was now slowly heated by means of a spirit-lamp until the salt was entirely decomposed. The gas produced occupied nearly the whole of the tube, which was two feet in height. On allowing the tube to cool, and introducing a small quantity of hydrochloric acid, the whole of the gas was absorbed, with the exception of a column of about three-quarters of an inch in height, showing that the space above the mercury was entirely composed of ammoniacal gas. Now, the decomposition of this salt into no other gas than ammonia, and no other solid products than chloride of ammonium and protochloride of cobalt, is only compatible with a certain number of atoms of hydrogen, which is sixteen; for—

$$3Cl, 2Co, 5N, 16H = 2CoCl + NH^4Cl + 4NH^3.$$

Had there been one or two equivalents less of hydrogen, one equivalent of ammonia would have been broken up, giving hydrogen and nitrogen not condensed by the hydrochloric acid.

Assuming, then, the above number of atoms to be correct, and applying Berzelius's theory of the copulated compounds, the formula of this salt may be written—

$$3(NH^4Cl) + 2(NH^2Co);$$

that is, a compound of 3 equivalents of chloride of ammonium with 2 equivalents of an ammonia in which 1 atom of hydrogen is replaced by cobalt. In fact the salt has the characters of such conjugate compounds. It has the properties of chloride of ammonium with regard to form and taste; while, on the other hand, the basic properties of the 2 equivalents of ammonia have totally disappeared, the salt being quite neutral to test-paper. This compound is analogous to the remarkable platinum-compounds discovered by Gros and Reiset: but with this difference, that it is a sesqui-conjugated compound, if it may be so called, being composed of 3 equivalents of the salt united with 2 equivalents of the adjunct.

Another way of grouping the atoms of this compound is the following, proposed by Mr. Graham :—

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$$Cl^3 \begin{cases} NH^2\,Co^2 \\ NH^3,\ NH^4 \\ NH^3,\ NH^4 \end{cases}$$

NH^2Co^2 represents an ammonium in which 2 equivalents of hydrogen are replaced by 2 equivalents of cobalt; while $NH^3\ NH^4$ represents an ammonium in which 1 equivalent of hydrogen is replaced by ammonium itself, as the hydrogen of ammonia is replaced by ethyl, methyl, &c. in Wurtz's and Hofmann's bases. Or

$$ClN \begin{cases} H^2 \\ Co^2 \end{cases} + 2ClN \begin{cases} H^3 \\ NH^4 \end{cases}$$

The compound would then be viewed as a double salt, composed of one equivalent of a chloride of cobalt-ammonium and two equivalents of a chloride of ammonium, in which the fourth atom of hydrogen is replaced by ammonium.

This peculiar compound has the property of forming double salts with bichloride of platinum and protochloride of mercury.

Double salt with bichloride of platinum.—On adding a warm solution of the salt to bichloride of platinum in excess, a silky crystalline, buff-colored precipitate falls down, much less soluble than the salt itself; it may therefore be washed with water, thrown on a filter, and dried.

12 grains of this double salt were fused with carbonate of soda, dissolved in hot water and filtered, to separate the platinum and oxide of cobalt. The solution neutralised with nitric acid and precipitated with nitrate of silver, gave 20·11 grs. Ag Cl= 4·975 Cl=41·6 per cent. The filtrate of platinum and oxide of cobalt, after being ignited, was treated with boiling hydrochloric acid, which dissolved out the cobalt, and left 4·05 platinum=33·75 per cent.

18·59 grains of double salt reduced by hydrogen gave 8·06 mixed metals=43·35 per cent. giving 9·60 per cent. for the cobalt. The double salt is consequently composed of 1 equivalent of the new compound, and 2 equivalents of bichloride of platinum.

	Calculated.		Found.
5Cl	=248·5	42·12	41·60
2Pt	=256·2	33·43	33.75
2Co	= 59	10	9·60
5N	= 70		
16H	= 16		

the formula of which is—

$$Cl^3 \begin{cases} NH^2Co^2 \\ 2(NH^3NH^4) \end{cases} + 2PtCl^2.$$

When this salt is decomposed by heat, treated with nitro-hydrochloric acid. and the excess of acid driven off by heat, the solution crystallises in large, orange-brown, prismatic tables, no mother-liquor remaining. this salt proves to be a double chloride platinum and cobalt, the 2 equivalents of bichloride of platinum combining with 2 equivalents of protochloride of cobalt from the new compound.

Double salt with protochloride of mercury.—Prepared in the same way as the preceding double salt, by adding a warm solution of the cobalt-salt to an excess of protochloride of mercury, a bulky silky precipitate is formed, composed of small red needles. This may be collected on a filter, slightly washed with cold water and recrystallized from a warm solution, the double salt being tolerably soluble in hot water.

15 grains fused with carbonate of soda in the same way as the double plantinum-salt, gave 18·10 grs. Ag Cl=4·477 Cl=29·84 per cent.

14·16 grs. reduced by hydrogen gave 0·10 cobalt=5·65 per cent.

	Calculated.		Found.
9Cl	=319·5	30·00	29·84
6Hg	=600		
2Co	= 59	5·54	5·65
5N	= 70		
16H	= 16		

This double salt contains, therefore for 1 equivalent of the cobalt compound, 6 equivalents of protochloride of mercury.

$$Cl^3 \begin{cases} NH^2Co^2 \\ 2(NH^3\,NH^4) \end{cases} + 6Hg\ Cl.$$

Recently prepared oxide of silver throws down the chlorine from the new ammoniacal compound, a highly alkaline red solution remaining, not having the slightest odour of ammonia. On standing, for a few hours, it decomposes, amonia is evolved, and hydrated peroxide of cobalt precipitated. The compound in solution represents, before changing the base of the present class of salts. It is an oxide, of which the composition is the same as that of the chloride already described, with the substitution of 3 equivalents of oxygen for 3 equivalent of chlorine:—

$$\text{Formula of new cobalt base} \quad O^3 \begin{cases} NH^2Co^2 \\ NH^3NH^4. \\ NH^3NH^4 \end{cases}$$

The study of this and other allied compounds of cobalt which exist, will no doubt greatly extend our views respecting the compound ammonias.

The chlorine of the original chloride may also be eliminated by any silver-salt, an analogous cobalt-salt containing the acid of the silver salt being formed and remaining in solution. In this way, a sulphate, nitrate, oxalate, acetate, and carbonate of the new base have been obtained. From the carbonate, the author has prepared the

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bromide and iodide, which have the octohedral form of the chloride, are just as sparingly soluble in water, and of a still darker ruby color. The bromide was found to contain 61·15 per cent of bromine, the calculated amount being 61·8 per cent.

The insolubility, of this ammoniacal compound of cobalt in boiling hydrochloric acid may be advantageously turned to account in the preparation of chemically pure cobalt, and also in the qualitative examination of substances containing small quantities of cobalt. The pulverised ore, or its oxide to be purified, is dissolved in nitro-hydrochloric acid, diluted with water, and filtered in order to separate any gangue or insoluble residue. Chloride of ammonium is now added in large excess, and the liquid saturated with ammonia; it is then poured into a glass bottle, and oxidated in the way already described in the preparation of the new salts. During the oxidation, a certain quantity of the new compound is deposited, especially when the solutions are rather concentrated, on account of its insolubility in a strong solution of chloride of ammonium. The solution still retains a certain quantity of cobalt-salt; it is therefore boiled with a considerable excess of hydrochloric acid, which causes the total precipitation of the new compound, dissolving at the same time any oxide of iron or other oxides thrown down by the ammonia. When cold, the clear liquid is decanted off, and the deposit well washed with acidulated water and then dried. By heating this compound to low redness, it is decomposed, leaving for residue, protochloride of cobalt slightly decomposed, but absolutely free from any other metal. This may be reduced by hydrogen gas, giving pure metallic cobalt.

By these means, the author has been able to prepare perfectly pure cobalt directly from the grey cobalt-ore of Tunaberg, which is an arsenio-sulphide of cobalt, and also to detect small quantities of cobalt in different samples of oxide of nickel.

The foregoing results embody the most definite conclusions of an investigation of the ammoniacal salts of cobalt which Mr. F. Claudet has had in hand for the last two or three years. M. Frémy has also lately announced that he is occupied with an extended inquiry into the same class of compounds, respecting which he has published some important general results. Dr. A. Genth appears also to have formed several of the salts of the new base above described, but his analytical results differ entirely from those given in the present paper.—*Philosophical Magazine and Journal of the Chemical Society.*

ON HŒMATOIDINE AND BILIFULVINE.

BY M. VIRCHOW.

THE author refers to Reichert's paper, showing that our knowledge of the formation of crystalline compounds has been importantly extended by the discovery of the existence of an albuminous substance in a crystalline form. In a substance resembling dried blood in appearance, probably deriving its origin from an extravasation of this liquid, which covered the surface of the placenta and the membranes of an almost mature fœtus of a guinea-pig, as also the adjacent mucous membrane of the uterus, Reichert found tetrahedral crystals. They were of a blood-red color, and appeared to consist of a protein substance impregnated with hæmatine. Although their other chemical and physical properties, which are very remarkable, did not exhibit any important relation to the crystals of hæmatoidine, yet there is no doubt that their generic similarity is very great. If Reichert's view, that crystallization is a property inherent to the proteine substance, should be confirmed, it would also become a question in regard to the crystals of hæmatoidine, whether their formation must not be ascribed to the concurrance of the proteine substance. The coloring matter would then hold the same relation in them as, *e. g.*, the coloring metallic salts in crystals of quartz, the proteine substance alone forming the crystalline skeleton, and the coloring matter a merely mechanically-mixed ingredient. Wherever hæmatoidine is being formed, hæmatine and some proteine substance are present. Hence the author's conclusion, that hæmatoidine is a compound of both. The author showed, on a former occasion, that after treating the pigment-crystals with various chemical reagents, amorphous granular flakes result, and which, in many cases, on the formation of the pigment in amorphous proteine matter, surround the colored grains as a colorless envelope. He also showed that crystals of hæmatoide may be formed under these three circumstances:—

1st, in cells;

2nd, in amorphous proteine matter (in both cases arising from diffused hæmatine):

3rd, from aggregations of blood-corpuscles, which fuse together without diffusion of the hæmatine, and undergo change simultaneously.

With regard to Henle's supposition, that hæmatoidine is of a fatty nature, the author remarks that fat has no doubt a peculiar attraction for this substance, and seems in

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some manner to favor its formation by promoting the transformation of hæmatine; but he believes that it is not of a fatty nature, and that the occurrence of colored drops of fat, after treating masses of hæmatoidine with mineral acids, proves nothing, because in this case the fat is colorless, and its surface is either covered with a colored layer, or the coloration is only apparent, probably arising from mere reflection. It differs crystallographically from cholesterine, besides which it is often found simultaneously with this substance, as in cysts of the thyroid gland. Its crystalline form is also entirely different from that of stearine; and besides, pure crystals of the latter have not yet been found in the human body.

His investigations of the derivatives of hæmotine, especially hæmatoïdine, led him to camparisons with the coloring matter of the bile, and to the question of its origin from the coloring matter of the blood. The great similarity between hæmatoidine and cholepyrrine, rendered it desirable first to procure crystals of cholepyrrhine. Berzelius once only obtained small reddish-yellow crystals from the bile, which he denominated bilifulvine; and Bizio found emerald-green rhomboidal crystals in morbid bile, to which he gave the name of erythrogen. The author once found, in and upon the wall of the sacs of Echinococci in the liver, hæmatoidine and semi-crystalline grains and lumps of cholepyrrhine. Since this he has repeatedly found crystals corresponding to bilifulvine in the liver and in the bile, and principally under two circumstances, retention of the bile, and chronic catarrh of the gall-bladder. The coloring matter of the bile becomes precipitated upon the altered mucus, subsequently undergoes further alterations, and with the altered mucus forms the basis of gall-stones. Simultaneously, probably in consequence of the decomposition of the fatty acids and cholates by a newly-formed acid, free drops and crystals of fat are formed, the latter of which sometimes, but rarely, exhibit the acicular bubbles of margaric acid, but most frequently the well-known plates of cholestrine. The bile then appears as a thickish, sometimes almost pasty and lumpy mass, of a dark brown color, in which peculiar small dark points are distinguishable. Under the microscope, the crystals of bilifulvine are frequently found, especially at these spots; They form longish, very fine needles, always of a yellowish-red color. They are usually single, or several combined. At first sight it appears that most of them have a thick globular extremity, and a very fine capillary point; and they very often have a curved, variously-bent and twisted form, thus resembling the lithate of ammonia. Closer examination shows that these appearances result from the needles consisting of an aggregation of smaller crystals, variously superimposed and combined with drops of fat and plates of cholestrine

The needles of bilifulvine react in a totally different manner from those of hæmatoidine; yet there is some resemblance. Caustic alkalies, especially potash, dissolve them tolerably readily. When the solution is neutralised and acidified, no separation of crystals occurs, nor is there any precipitate. Acetic acid produces no change. Concentrated sulphuric acid, when acting slowly, gradually attacks the needles, which at first become dark; in a current of it, a reddish-yellow circle first forms around them, and the whole then vanishes. Nitric acid has but little action upon them except when the action is very intense, when they are decomposed. From these experiments, bilifulvine belongs to the granular pigments, and probably holds an intermediate place between hæmatoidine and melanine. Chemical investigation shows that these crystals are not formed by the deposition of coloring matter upon crystals of margarine and filaments of fungi. Ether removes the drops and crystals of fat, and leaves the needles unchanged; whilst potash sulphuric acid destroy the needles and leave the fungi unaltered.—*Annalen der Chemie und Pharmacie.*

ON THE ABSENCE OF SUGAR FROM THE URINE OF HYSTERICAL AND EPILEPTIC PERSONS, SOME HOURS AFTER THE ATTACKS.

BY M. MICHÉA.

In a note on glucosuria communicated to the *Académie des Sciences* in its sitting of the 1st December, M. Reynoso affirms that sugar is to be found in the urine of persons suffering under various affections, amongst others, in the urine of hysterical and epileptic patients; and he invites physicians who have an opportunity of studying these affections, to make researches on this point.

As regards nervous patients, I am in a position to reply immediately to the invitation of M. Reynoso.

Having read, some months ago, in a work on glucosuria, published in Germany by Dr. Heller, that the urine of nervous patients was saccharine, I wished to ascer-

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tain whether this assertion were well founded.

Finding sugar in the urine is a simple thing; a skilful chemist is unnecessary for that.

The urine is placed in a glass tube into which are poured a few drops of a highly concentrated solution of potassa, and exposed to the flame of a spirit-lamp until it boils. If there is sugar in it, the urine becomes darker, and becomes the more so in proportion to the quantity contained; it passes from an orange yellow to a fine pomegranate red; and if a few drops of nitric acid are poured into it until the color becomes a little paler and the whole allowed to repose for a short time, the peculiar odor of molasses is developed.

I have analysed in this manner the urine passed some hours after the attacks in four cases of hysteria and two cases of epilepsy.

I have likewise analysed it, during the whole duration of the malady, in seven cases of *delirium tremens*.

I have examined it each day for several weeks, in six cases of general paralysis of the third degree, in five cases of mania both acute and chronic, and in three cases of partial, circumscribed delirium.

Now, in these twenty-seven cases I have never found the smallest vestige of sugar in the urine.—*Comptes Rendus*, No. 24, December 15th, 1851.

DESCRIPTION OF THE LAPIS LAZULI FOUND IN LARGE QUANTITIES IN THE CORDILLERAS OF THE ANDES.

BY F. FIELD, F.C.S.

THE discovery of immense masses of a bright blue rock, in the Cordilleras, led a miner to suppose he had discovered a vein of the blue carbonate of copper. On analyzing a specimen, I found it to be perfectly destitute of that metal, and to be in fact a true lapis lazuli, interspersed with small veins of pure carbonate of lime. Heated by itself, it loses color, but regains its primitive appearance on cooling; with nitre, on the application of the blow-pipe flame, it becomes highly incandescent, and of a most beautiful green. It dissolves in borax with lively effervescence, into a pure colorless glass, becoming slightly opalescent on cooling. On the addition of nitric acid, there is a brisk evolution of carbonic acid—the mineral becomes perfectly colorless, and presents a solid mass of gelatinous silica. The following is its composition in 100 parts. The analysis offered no difficulties:

Silica	37·60
Alumina	11·21
Sulphur	1·65
Iron	0·08
Magnesia	0·36
Soda	9·66
Carbonic acid	15·05
Lime	24·10
	99·71

This probably is not exactly the proper expression of its constitution, the sulphur no doubt being in combination with a portion of the sodium from the soda, as well as with iron. That the sulphur exists *as such*, and not in the state of sulphuric acid, is evident by the addition of acetic acid, which causes a strong disengagement of sulphuretted hydrogen, and in the residue no trace of sulphur can be detected by solution, and addition of a salt of baryta. I believe the color of the stone is usually attributed to minute portions of sulphide of iron and sodium. Gmelin, however, in an analysis of lapis lazuli, places all the sulphur as sulphuric acid. (See Chapman's Mineralogy, p. 81.—*Quarterly Journal of the Chemical Society.*

ON A PECULIAR ACID SECRETED IN THE PULMONARY PARENCHYMA.

BY M. F. VERDEIL.

I HAVE been enabled to extract from the pulmonary parenchyma of most animals, a peculiar crystallised acid, forming with bases salts which likewise crystallise.

This acid, which is secreted by the pulmonary parenchyma, is formed partly in the free state, but in the greatest proportion in the state of the salt of soda.

To obtain it in the isolated state I adopted the following process:—

The tissue of the lung is first cut very fine, then bruised with cold distilled water; the liquid, pressed through a cloth, possesses a perceptibly acid reaction. The liquor is heated on a sand bath to coagulate the albumen which it contains, then neutralised with baryta water, and evaporated on a sand bath. The liquor, reduced to three fourths of its original bulk, is precipitated by a solution of sulphate of copper, which causes a bulky precipitate. The filtered, liquid contains an excess of sulphate of copper: this is removed by adding a

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small quantity of a solution of sulphuret of barium; an insoluble precipitate of sulphate of baryta and sulphuret of copper is formed. The filtered liquor is evaporated until crystals of sulphate of soda are formed; a little dilute sulphuric acid is then added, and the whole is then treated with boiling absolute alcohol: the latter dissolves the acid of the lungs, and leaves the sulphate of soda undissolved.

On the cooling of the alcohol, and at the end of a few hours crystals are formed, consisting of needles grouped round a centre, and which very soon cover the sides of the vessel.

By the addition of sulphate of copper to the primary liquor, we have eliminated a host of substances, such as fats non-coagulated albumen, &c., which would have prevented the isolation of the acid of the lungs.

This acid, thus obtained in the crystallised state, is a brilliant body powerfully refracting light. Heated to 212°F., it does not lose water of crystallisation; at a higher temperature, it crepitates and fuses and is then decomposed, giving rise to empyreumatic products: a bulky charcoal remains which disappears, leaving no ashes.

This body is very soluble in water, insoluble in cold alcohol, but soluble in boiling alcohol; it is insoluble in ether.

The elementary analysis shows that this acid is formed of carbon, hydrogen, nitrogen, sulphur, and oxygen in definite proportions.

The acid of the lungs forms crystallisable salts with the bases, and expels carbonic acid from the carbonates.

The presence of an acid secreted by the parenchyma of the lungs itself, appears to us to have a very high physiological bearing. Indeed the secreted acid is formed in contact with the carbonate of soda of the blood brought to it by the capillary vessels; it decomposes this salt, combining with the soda, and the carbonic acid, being liberated, may be exhaled by the respiration. The presence of a portion of this acid, in a free state in the lungs, shows that it is formed in this organ, and not in the blood, which is alkaline. In combining with the soda of the blood, the acid of the lungs does not change the action of that fluid, since it only takes the place of the carbonic acid, which is expelled by the respiration.

In an early memoir, we shall present the complete results to which our chemical and physiological researches on the presence of this acid in the lungs have led us.—*Comptes Rendus*, No. 22, 1st Dec., 1851.

ON THE DEVELOPEMENT OF FAT IN ANIMALS.

BY M. DANCEL.

THE author merely mentions in this note the results of his observations on the human species. Several persons whose obesity was not only a source of continual discomfort, but constituted, in some degree, a diseased state have lost a considerable amount of their fat by changing their alimentary regimen, by depriving themselves almost entirely of vegetables, and feculant substances, by diminishing the quantity of liquid taken, and, when necessary, augmenting the quantity of meat which they had formerly been in the habit of consuming. —*Comptes Rendus* No. 24, December 15th 1851.

ON COPPER CRYSTALLISED BY MEANS OF PHOSPHORUS.

BY F. WÖHLER.

THE experiments of Böck end Vogel, Sen., have taught us that the whole of the copper in a solution of the sulphate contained in closed vessels is reduced by phosphorus; crystalline laminæ of greater or less thickness, according to the duration of the reaction, having the form of the piece of phosphorus and of a beautiful bright copper color being formed. If the pieces of phosphorus are placed in contact with bright copper wires, reduction of the copper also takes place upon them, and this in distinct, mostly well-formed octohedral crystals, the form of which, when the process is allowed to continue for weeks and months, with a quantity of undissolved crystals of the sulphate in the solution, is distinguishable to the naked eye; at the same time, the whole of the phosphorus disappears, and the masses of copper reduced by it are found filled inside with black pulverulent phosphuret of copper.—*Ann. der Chem. und Pharm.* vol. lxxix, p. 126.

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II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

PHOTOGRAPHY IN FRANCE.

BY R. FENTON, ESQ.

(Communicated by the Author.)

THOSE of your readers who take any interest in the fascinating study of Photography will, doubtless, feel some curiosity to know what progress our neighbors on the other side of the water are making, and which of the many applications of its principles they are following, is likely to lead to the most useful results.

Everybody will recollect in the south aisle of the Crystal Palace, the unrivalled productions of Martens, printed from albumined glass negatives. Their wonderful delicacy of detail, united with artistic breadth of effect, seemed to indicate the process by which they were executed, as the path into which every one should press, who wished to turn his science to the most practical account.

The difficulties, however, of preparation of the plates, and the numerous causes of failure, have caused many persons, both here and in France, to look for some other means of more easily subduing that most subtle of all agents—light—to the will of the artist and the man of science.

On this subject the last word is not yet said "adhuc sub judice lis est," nor is it my purpose at present, even if I were sufficiently qualified, to dive into this discussion. I wish merely to point attention to the machinery which is employed on the other side of the water, to facilitate the advance of the science, and to render the services of its followers most profitably available for the common progress.—

Presuming that many of the facts here stated are well known to many of our photographers, I will mention, first of all, that there is a photographic society in Paris, having a fixed place of meeting, and a regular organ of publicity.

Its head quarters are, at present, in a part of the house of its president, the Col. de Montfort. An entire suite of apartments, consisting of 4 or 5 rooms, at the top of the house, of course, and opening on to an extensive terrace, with an excellent light, is devoted to the purposes of the society. One room is entirely occupied, walls, drawers, and cupboards, with choice specimens of the art, mostly in metal; another is fitted up as a laboratory, one corner of which is an enclosure surrounded with yellow curtains, to exclude the light. In fact there is every requisite facility, both for receiving the amateurs in a suitable *locale*, and for their trying, experimentally, any new development of the science.

The society includes in its ranks many of the most distinguished of the French artists, who, as a body, have been much more quick than our own in appreciating the great advantages which this science presents to the careful and conscientious interpeter of nature, and the complete extinguisher it puts upon the artist who seeks success by tricky effects of color, and oppositions of light and shade,

In the lower part of the same house, a laboratory shop has been opened by Mr. Puech, exclusively for the manufacture and sale of photoghraphic chemicals.

The proceedings of the Society are regularly reported in a weekly journal under the title of *La Lumiere*, the bureau of which was also, until lately, in the house if not under the direction of M. de Montfort. It has, however, recently been established upon an independent footing, though still connected with the Society. In the office of the journal is an album of specimens illustrating the progress of the art since its first application to the production of paper pictures. Containing, not only a collection of artistic proofs, but also results of the various experiments by which advances in the science have from time to time been made, this album forms an invaluable record of the history of photography.

In this, as in every other pursuit, the most complete results are obtained by the division of labor. It demands study of one kind to obtain a clear and brilliant negative impression. To produce from that negative a positive picture of any shade of color that may be desired, and of depth and richness of tone, requires a separate experience, and considerable length of practice.

It is often found by the photographer that all the time which he can give to his favorite pursuit, is insufficient to do all that he wishes in the acquisition of satisfactory negatives. When he is so fortunate as to produce one which will, as the phrase goes, print well, he is more solicitous to repeat his success in the reproduction of some new object than to proceed immediately to the multiplication of the positive copies of his pictures, a result which he knows can be attained at any time.

This want is provided for in Paris, by the establishment in the rue St. Nicolas

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d'Antin, No. 72, of a photographic printing establishment, the director of which devotes his time to the study of the positive photograph.

For a small charge, the positive pictures are here printed off, and fixed, so as to present any color, or gradation of color and tone that may be previously decided upon by the owner of the negative. When it is remembered how, in the process of fixing, the color of the picture is never actually stationary: and how, to produce a certain color, it is often necessary to remove the picture, at different stages of its progress, from one bath of hyposulphite to another, it will at once be seen of what advantage it must be, that a process demanding such watchfulness and discriminating observation should be made a separate and special department of the science. Why, in fact, should not the reproduction of these positive photographs be as distinct an occupation from the making of the negative type, as is the engraving of a steel plate, from the taking impressions of it upon paper.

Nothing is more common, than to see in the pages of your journal, a dispute as to the priority of invention of certain improvements in the various processes. The occurrence of these disputes is, to a certain extent, remedied in Paris, by the existence of the Academy of Sciences, to which may be confided, in a sealed enclosure, the principle of any alleged discovery. The author thus makes evident the date of his claim, and the amount of its originality; while he is not obliged to present his discoveries to the world, before having fully investigated their extent and possible results. The academy takes no notice of any claim to priority of discovery, unless the whole of the process is fully laid before it; and a case occurred during my stay, illustrating this rule in a way which may be of use, as a hint, to some people this side of the water. Two gentlemen from Havre presented to the notice of the Academy, one or more daguerreotypes, representing marine views, in which, not only a vessel in sail was pictured with all the sharp detail of a motionless object, but the waves themselves, their crests and edges, and the clouds in the sky were faithfully represented. No notice was taken in the minutes of the Society of so extraordinary a result, and it was privately intimated to the persons in question, that the reason of such proceeding, was their concealment of the mode of operation; a want of ingenuousness, as little in accordance with the intentions of the government which presented to the whole French nation the results of Niepce's and Daguerre's researches, as with the generous and loyal readiness with which subsequent experimenters have made known their discoveries to the public.

So much for the machinery of the study of photography in France. There are yet other advantages which they possess on that side of the water;—such as the absence of any patent interfering with the enterprise of individuals, and the liberal encouragement given by the late government, to the eminent in photographic skill. I was shown, in October last, by M. Le Gray, the author of the wax process, and M. Mestral, an ingenious amateur, several hundred negatives, made by them for the government, during a tour in the provinces, from which they had just returned. The subjects were mostly such as were equally interesting to the antiquarian and the lover of the picturesque.

I may mention here, that the wax process by which these pictures were produced seems to have superseded in practical employment all the other kinds of prepared paper.

At present, excited by the accounts from England, they are all occupied with experiments on collodion. In company with M. de Montfort, I made essays with collodion prepared by M. Puech. Neither these nor subsequent ones made with collodion brought from England, were very promising. Some collodion transmitted to me subsequently by M. Puech, of his preparation, presents great tenacity and adhesiveness and but a very small amount of sensitiveness, as compared with that sold by Messrs. Archer, Horne, & Co., Knight, and other English chemists.

Into the question, however, of the comparative utility of different processes, I do not wish to enter at present; I have merely stated what measures are adopted in France to advance photographic knowledge by combination, emulation, and publicity; and what assistance is rendered by the government. From our rulers, it is not our practice to seek or hope for any assistance in such matters; but surely it is something strange that in the organisation of the voluntary system of mutual assistance, we should have to receive lessons from Frenchmen.

MEANS OF PRESERVING LIMESTONE MONUMENTS.

BY M. ROCHAS.

In looking at the chemical composition of the various species of limestone which com-

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pose the greater part of most of our oldest and most beautiful public buildings, it is evident that those limestones which have best resisted the atmospheric influence are those which contain most silica in the state of combination; whilst those in which the silica is found only in the state of mixture, and those which contain none at all, are very much decayed.

From the observation and proof of these facts, I was led to seek, and if I am not mistaken, I have found the means of remedying this evil. It is necessary to put these alterable materials in contact with silica, in such conditions that this substance may combine with the lime of the limestones, in order to convert them into silicate of lime, which is very hard and very compact, and, to a certain extent, unalterable. With this object, I have been making numerous researches for several years, taking as a point of departure the prior attempts of M. Kuhlmann.

I have the honor of exhibiting to the Academy three samples of limestones which I have silicated. I am indebted for them to the kindness of M. Violet le Duc, who selected them from among the old materials of bad qulity, of the most decayed parts of Notre-Dame; I have left part of each of these samples untouched, in order that the effects of silicating might be easily compared.

In concluding this letter, I beg permission to call the attention of the Academy to the monuments recently discovered by M. Mariette, in the excavations he is making in the Temple of Serapis, at Memphis. At the commencement of the present year, (1851), in my travels in the East, I had an opportunity of visiting, on the spot, the statues of the Sphinxes, &c., which were then discovered. These monuments are for the most part of the tender limestone of the Arabic chain, which naturally presents little cohesion. I ascertained that having been buried for so many centuries, this limestone was, so to speak, totally deprived of solidity; indeed, soon after these statues had been exposed to the air, after exhumation, they scaled and deteriorated so promptly, that it was considered necessary to cover them with sand.

M. Mariette mentioned to me the anxiety which he felt as to the preservation of these statues, and their conveyance to France; I then told him that it was possible to confer on them, on the spot, by silicating them, the solidity necessary for the transport, and I offered to take this operation upon myself.—*Comptes Rendus*, No. 22, 1st December, 1851.

ON DRIED BLOOD AS MANURE.

BY J. T. WAY, CONSULTING CHEMIST TO THE ROYAL ACRICULTURAL SOCIETY.

THE value of blood as manure has been long known, but many circumstances have combined to prevent it from being employed to any considerable extent.

That blood should be a highly fertilising substance, we should infer from its composition. I do not propose here to go into any elaborate statement of the analysis of blood, my object being principally to enquire what prospect there is that this valuable substance may be rescued from waste, and systematically thrown into the manure market as a dry and portable manure.

But it may be as well to state that ox-blood, according to the analysis of Dr. Playfair, contains from 79 to 82 parts of water, the remaining portion of from 18 to 21 parts, being, of course, dry matter. In this respect blood very closely resembles flesh, which, according to the same authority, contains 77 parts of water and 23 of dry matter. The ultimate composition of blood and flesh is identical. Omitting the ashes in each case, Dr. Playfair obtained from the analysis of dry blood and dry flesh the following results:

	Dry Ox-blood.	Dry Ox-flesh.
Carbon	54·35	54·12
Hydrogen	7·50	7·89
Nitrogen	15·76	15·67
Oxygen	22·39	22·32
	100·00	100·00

The proportion of ash in blood is small, not exceeding 5 per cent. on the dry matter. Of this small quantity likewise fully one-half is common salt, whilst perhaps not more than 20 per cent. of the ash is of any great value to vegetation.

I am inclined, therefore, in speaking of the value of blood as manure, to put aside the mineral matters as too insignificant to require attention, resting its chief merits upon the fact that it is almost pure animal matter, and contains a high per centage of nitrogen. Hitherto comparatively little blood has been prepared in the dry state, and that little has been sold to the makers of prussiate of potash. Some manufacturers, however, are turning their attention to the possibility of preparing the dried substance on a large scale for manure, and I am in hopes that the value of this substance will be found such as to enable farmers to purchase it at a price high enough both to remunerate and encourage the maker, and to

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secure its application to the purposes of agriculture. From a manufacturer of dry blood I have received from time to time several specimens for analysis, and the results are such as to convince me that blood may be dried on the large scale with perfect success, and that the product obtained may fully come up practically to what might be expected from a knowledge of the composition of the material employed.

The quantity of nitrogen in any specimen of dried blood will be dependent principally on two circumstances: first, the extent to which the blood is dried—because, although sufficiently dry to be portable and pulverulent, it will never be absolutely free from moisture; and, secondly, the care and attention bestowed on the evaporation. It is plain that if the blood get carbonised and burnt its value must be proportionately reduced, and, for this reason, open fires should, if possible, be entirely avoided in the heating operation, and steam-cased vessels substituted.

I give now the determination of nitrogen and water in three samples of dried blood, made on the large scale at different times, and sent to me as before mentioned:—

	Water.	Nitrogen.	Ammonia to which the Nitrogen is equal.
Sample No. 1..	8·78	13·24	16·07
,, No. 2..	7·91	13·58	16·49
,, No. 3...	6·19	13·93	16·91

It will be observed that this result is very satisfactory, the proportion of the nitrogen being in the last case nearly as high as in average samples of Peruvian guano. The following analyses of other samples will show—what hardly indeed requires demonstration—that in purchasing dried blood it will be necessary that the farmer is assured that *it is dry*. Thus, samples not externally moist were found to contain:—

	Moisture.	Nitrogen.	Equal to Ammonia.
Sample No. 4..	21·81	11·44	13·89
,, No. 5..	29·46	10·45	12·69
,, No. 6..	22·11	11·38	13·82
,, No. 7..	35·43	8·74	10·59

I would not be mis-understood to say that these samples have been offered in the market as dry blood; on the contrary, they have been submitted to me by the makers to determine *how* dry they were, in order that a price may be fixed upon them. It is plain that a farther drying—easily accomplished—will bring them up to the standard of other samples. Altogether, therefore, I think that we have a fair chance of getting, before long, a good article of this kind on a practical scale. The *quantity* to be obtained, and the *price* at which it may be purchased, are two other important questions.

From an excellent article on blood, in Morton's "Cyclopædia of Agriculture," to which the reader will refer with much advantage, to himself, I take the following sentence, with the explanatory note:—"The population of Great Britain at the present moment is about 20 millions; and if we take 75 lbs.* as the average amount of flesh meat consumed by each individual, we have 1,500,000,000 lbs. as the total animal food in one year. And as the blood may be taken to represent at least one-fourteenth of the net weight of an animal, the total weight of the blood of animals slaughtered for food in England will be about 100,000,000 lbs., or 45,000 tons."

This statement refers, of course, to blood in its ordinary state; and as it loses three-fourths of its weight in drying, we should have about 11,000 tons of dried blood as the total quantity available under the very best system of collection and preservation.

How very far the quantity practically available will fall short of this estimate (supposing the numbers given in the extract we have made to be correct) will at once be seen when it is considered that only the blood of these animals that are slaughtered for thickly-populated towns can be at all at the command of the manure dealer, and from this must be further deducted the quantity used for feeding pigs, &c. It often happens, too, that the butcher will find the price paid to him for the blood too small to compensate him for the trouble and annoyance of keeping it on his premises: and at this time large quantities are daily passed down the sewers of London by those who formerly disposed of it to the collectors.

It is difficult to fix the exact value of dried blood. Supposing it to contain as much nitrogen as the sample No. 3 above described, it would ultimately furnish about 17 per cent. of ammonia. The price of ammonia must not, for agricultural use, be higher than 6*d.* per lb., which would give the nitrogen value of fully dried blood of

"* In an asylum containing, in 1841, on an average 116 persons (10 adults and 106 male and female children), the annual consumption of meat was 104$\frac{7}{8}$ lbs.; and in a private family in London, consisting of a gentleman, his wife, ten chidren, and ten [?] servants, in 1840, the consumption for each person was 370$\frac{1}{2}$ lbs. of meat."—Porter's Progress of the Nation, p. 591.

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the best quality as about £9 10*s.* per ton; but it is to be remembered that Peruvian guano furnishes not only 17 per cent. of ammonia, but 25 per cent. of phosphate of lime, with other salts, for £9 10*s.* or £10 per ton, so that ammonia in guano is considerably cheaper than 6*d.* per. lb. As a *provisional price*, I think, perhaps, that from £8 to £9 may safely be given by the agriculturist for genuine *high dried* blood—I say as a provisional price, because we want experience yet of the precise action exercised respectively by ammoniacal salts and animal matter only in process of decomposition. It may be that the high per centage of carbonaceous matter supplied to the plant at the same time with nitrogen or ammonia by blood, will considerably enhance its fertilising influence. The farmer's experience will decide ultimately what is the true commercial value of this as of every other manure.

The crop which dried blood will most benefit is wheat. To hops it would prove an excellent manure; indeed, it would not fail to do good to any kind of vegetation if properly employed. A mixture of dried blood and mineral superphosphate of lime would be an admirable drill manure for turnips. Dried blood is likely to be effective on all soils, but especially on light sandy land. In conclusion, I would make a suggestion to manufacturers, based on theoretical considerations. The albumen of blood and the white of egg are of the same composition, and resemble each other in properties. The white of egg, when heated to a temperature of 165° or 170° F. coagulates and becomes insoluble in water; if, however, it is allowed to dry at a temperature below that named, it becomes a transparent brittle substance, which keeps for any time in its dry state, and is soluble in water. The albumen which is contained in the watery parts of blood equally coagulates with heat, and can equally be dried up without coagulation by a moderate temperature. From its solubility in water, it appears to me that it would be more active as a manure when so dried, than when the coagulation which renders it insoluble is allowed to take place; and I would suggest that some means should be tried with that end in view. I do not refer here to the separation of the clot of blood upon standing, but to the further solidification on heating to the boiling point.—*Journal of the Royal Agricultural Society of England*, No. XXVIII.

ON A NEW MODE OF PREPARING NEGATIVE PHOTOGRAPHIC PAPER.

BY M. GUSTAVE LEGRAY.

THOSE who are in the habit of practising photography on paper know the difficulty of obtaining paper of good quality and capable of taking the chemical preparations in an uniform manner. After a great number of attempts, I have succeeded in giving to the papers, so to speak, a kind of sizing which completely remedies this inconvenience. The new papers present such great advantages, as regards the certainty and facility of the operations, that I doubt not they will be generally adopted.

The matter which serves for this sizing is virgin wax. Virgin wax is maintained at the temperature of 212° F. in a large flat vessel. The paper is steeped in it until it has completely imbibed it. It is then withdrawn, and, after having placed the sheet between several folds of blotting paper, a moderately hot iron is passed over it, which makes the excess of wax pass into the blotting paper. A well-prepared sheet should present no shining point on its surface, and should be perfectly transparent.

This waxed paper is steeped in a hot solution formed of

	grammes.
Rice water	1000
Sugar of milk	40
Iodide of potassium	15
Cyanide of potassium	0·80
Fluoride of potassium	0·50

After remaining in this solution for half an hour, the leaf is withdrawn and dried by suspending it by one corner.

The leaf is afterwards steeped in a limpid solution of aceto-nitrate of silver formed of:—

	grammes.
Distilled water	300
Nitrate of silver	20
Crystallised acetic acid	24
Animal black	5

The animal black renders the paper more sensitive, and decolors the solutions when they have been used.

The sheet of paper should remain for three minutes in this solution, and, in order to ensure contact with the liquid, the two surfaces of the paper are rubbed with a hair pencil. The paper is afterwards washed several times with distilled water, and, finally, well dried between blotting paper.

After these two preparations, the paper may be immediately placed in the camera obscura. It may be kept without alteration for fifteen days in a dark place. In this

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respect it presents great advantages over all the photographic papers at present known. After exposure in the camera it is not necessary to subject the image immediately to the gallic acid; we may wait until the evening, or even for one or two days. Every one is aware how much this new process will facilitate operations in travelling.

The solution of gallic acid is composed of 1 gramme of gallic acid, 5 decigrammes of nitrate of silver and 200 grammes of distilled water. The proof is fixed with hyposulphite of soda as usual.

This process is so easy of execution that, during the mission in which I have been engaged for the Committee on Historical Monuments, I have often taken twenty-five or thirty proofs in a day.—*Comptes Rendus*, No. 23, Dec. 8, 1851.

AMERICAN PATENT FOR GOLD REFINING.

MOST of the native gold brought to the American mint for refining, contains silver, from which it must be separated before it can be supplied with the uniform proportion of alloy required by law in gold coin. For this purpose, the process now in use throughout the world, is to melt the gold to be refined previous to coining it, with two to three times its weight of silver. It is then granulated and exposed to the action of hot nitric or sulphuric acid, which dissolves out nearly all the silver, both that in the native metal and that added by the refiner, and thus leaves the gold in nearly a pure state, and ready to receive the necessary portion of alloy required in the gold coin. It will be seen at a glance, that allowing a million of California gold to weigh 53,250 ounces, or nearly two tons, it would require nearly six tons, or 161,250 ounces of silver, and worth about 190,000 dollars, to be kept constantly on hand to work it. The desideratum is, therefore, to find some process of working the gold by which this great outlay of silver may be prevented, and by which greater celerity may be effected; both of these results, the inventors of the two following processes allege they have obtained.

In the first, the argentiferous gold is converted into the chloride by the action of nascent nitro-muriatic acid generated by the reaction of sulphuric acid upon a mixture of nitrate of soda and common salt, or by other equivalent means. The silver contained in the native gold is also converted into the chloride by the same chemical reaction, and it is prevented from incrusting the gold by the more intense affinity, and the agitation produced by a jet of steam, which is constantly being forced into it. The gold is next precipitated in the metallic state upon the chloride of silver, by means of pulverised copperas. After washing the precipitate of gold and chloride of siver, the latter is reduced to the metallic state by the reaction of zinc and dilute sulphuric acid; and, subsequently, the silver is dissolved out by means of nitric acid. From the nitrate of silver obtained above, the metal in the pure state is precipitated in the usual way, by the reaction of zinc and dilute sulphuric acid.

In the second patent referred to, the design of the invention is to avoid the use of chloride in the first part of the process. The argentiferous gold is first melted down with zinc or other metal baser than silver, from which alloy the baser metal may be dissolved out by dilute sulphuric or other cheap acid, and the bullion pulverised; or an alloy of great brittleness made, which may be easily crushed or broken down by mechanical means, so as to fit the gold bullion for the direct action of nitric or other acid. The inventor states that he first mixes the argentiferous gold with twice or three times its weight of zinc, melts and stirs well the alloy, and then granulates the same by pouring it into water. The alloy thus obtained, in next treated in wooden vessels lined with lead, with dilute sulphuric acid, which removes the zinc, and leaves the argentiferous gold in a finely-divided pulverulent or spongy state. In this second operation heat is not required, and but little more sulphuric acid than will be necessary to form the sulphate of zinc.

Third. The argentiferous gold thus reduced to a spongy state, and still containing the silver untouched by the reagents used, is treated with hot nitric or sulphuric acid (the sulphate of zinc having been first entirely removed by washing), by which the silver is entirely removed, and to be obtained in a metallic state as in the former process, or in the usual way. Finally, the operation is finished by cupelling the gold, or melting it with such fluxes as borax, nitre, &c., and casting it into bars.—*American Patent Office Report*, 1850-51

EMPLOYMENT OF SULPHATE OF ZINC FOR THE PRESERVATION OF ANIMAL MATTERS.

BY M. FALCONY.

IN 1849, I commenced some experiments concerning the means of preserving animal matters from putrefaction, and I tried the

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various methods pointed out as most efficacious; but some evidently did not lead to the result announced; others presented inconveniences which rendered their employment incommodious or dangerous. Being desirous of arriving at a more satisfactory result, and knowing the property of metallic salts, I proceeded by the graduated application of these salts, and I proved that the sulphate of zinc dissolved in different degrees, according to the object for which it is intended, completely answered my purpose.

Indeed, I employed it in injections for the preservation of entire bodies and of their various parts, by performing the injection by one of the arteries, and in the proportion of 4 or 5 litres. The bodies thus injected are perfectly preserved, and they still remain unaltered in the anatomical cabinet of Genoa. These bodies retain their suppleness for more than forty days; they then begin to dry, retaining their natural color and losing their original bulk only in the parts which are vacant and not fleshy.

Parts of the body were injected by my liquid, and afterwards separated from the body; after a few days, they were injected with red and black solid matters, according to custom, in order to effect the preparation of the vessels. The colored composition penetrated into the capillary veins and arteries as well as, and even better than, if they had not been previously injected, or than if the parts had been subjected to a warm bath. A section being afterwards made, the muscles were found in a perfect state of preservation, and the color of the matters subsequently injected was such as to satisfy the most experienced anatomist.

I acted afterwards by immersion: the parts most difficult to preserve, the brain, the intestines, various pathological portions, are most completely preserved in the liquid, retaining all their characters without any alteration, and, which is very remarkable without even the contraction observed when alcohol is employed. The steel instruments employed for operations on bodies injected with this liquid not only undergo no alteration, but even, after being kept in this liquid for twenty-four hours, remain in good condition.—*Comptes Rendus*, No. 22, December 1st, 1851.

ON A NEW ALIMENTARY PRODUCT CALLED TASAJO, ANALOGUS TO BEEF BISCUIT.

In his work on Rural Economy, M. Boussingault relates how the inhabitants of South America preserve, in the midst of an unsupportable temperature and during long excursions, the muscular part of beef. This flesh, as is known, contains 78 per cent. of water. It is by evaporating this water in the sun that the *Haciendero* prepares what is called *Tasajo*.

The following are the details of this operation:—The quarters of beef are cut into thin strips; the skill of the operator consists in obtaining by means of a fine knife, strips of flesh several metres in length, which are sprinkled with maize flour, with the view of absorbing the juices of the meat. The bands or strips thus obtained are dried in the sun on bamboos. When the desiccation is complete, the *tasajo* is of a deep brown, its odor is not disagreeable and it is sufficiently flexible to be rolled into bundles; 100 parts of fresh meat give about 26 of *tasajo*. M. Boussingault thinks that the temperature at which this desiccation is effected is from 60 to 70° centigrade (140 to 158° F.)

The use of *tasago* is very prevalent in the auriferous districts where the miners pay no attention to agriculture. M. Boussingault has spoken to negroes of Chegco, who had never seen a bull. They were acquainted only with its dried flesh.

In campaign, *tasajo* is a great resource. The soldier whose knapsack contains 1 kilogr. of it has in reality as much as 4 kilogr. of fresh meat. We may say the same of the dried vegetables of M. Masson, which, being dried slowly and compressed by means of a hydraulic press, are reduced to an extraordinary degree. The heart of a cabbage of enormous size, dried by M. Masson's process, may be placed in the envelope of a letter, and on immersion in hot water swells to such a size as nearly to fill up the entire capacity of the pipkin.

Mr. Ashbel Smith, of the United States, communicated some days ago, to the *Société Nationale et Centrale d'Agriculture*, a note on the possibility of easily nourishing travellers who penetrate into uninhabited countries, by the employment of meat biscuit. The following are the details of this communication:—

"The large caravans which traverse the immense plains of Texas, frequently underwent the greatest sufferings from want of food. It was necessary to find the means of furnishing them, within small compass and small weight, the greatest amount of nourishment. This was effected by means of a very simple mixture of juice or essence of meat, containing all the nourishing parts of the meat (minus the fat), wheat flour and water. Entire animals were

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boiled in a boiler, by means of steam, for twelve or fifteen hours; the juice obtained was mixed with 1 part of flour to 12 parts of muscular fibre in a sort of solution. The biscuit obtained did not attract moisture, because it contained no salt; it was not attacked by insects and did not become mouldy. It was sent from New York to China, and back without undergoing any alteration: I have kept some for twelve months in a bag without the slightest decomposition taking place. Excellent soup was obtained by making a porridge with water, salt and about an ounce of this product. The food had an excellent taste of fresh meat. I estimate that a man may live perfectly well on 160 grammes (about 5 ounces) of meat biscuit per day. Thanks to this discovery, we may now travel in perfect safety the immense solitudes of Texas and other parts of the New World."

To preserve meats and vegetables in the fresh state by means of the very simple process of Appert and Masson, to combine the farina of cereals with the soluble nutritive substances of meat; to convert sea-water into fresh and drinkable water, to disinfect stagnant waters, and to purify confined and vitiated atmospheres; these are certainly among the happiest applications of science. Berthollet did not over-rate the high social bearing of chemistry when he said of it: "There exists no human occupation which is not illumined by its light."

Since we have entered upon the examination of the resources which chemistry may furnish in the preservation of food, we will say a few words on a process of making butter, by M. Chalambel, (for which see THE CHEMIST, December, 1851, page 125), to which some advantages appear to be attached.

All agriculturists know that the yielding of butter varies according to localities and the processes employed. In some rare localities as much as 5·25 parts of butter are obtained from 100 of milk. M. Zierle states it at 2·77, and M. Weiss at 2·47 per cent. Experiments made at Bechelbronn gave M. Boussingault for 100 parts of milk.

White cheese, pressed . .	8·93
Butter	3·33
Butter-milk	12·27
Whey	75·47
	100·00

Here follows M. Chalambel's process, which it is unnecessary for us to give here.

There has recently been prepared in Paris a preparation called beef-biscuit (*biscuit-bœuf*), by employing the soluble matters extracted from meat and combining them with flour, salt, and pepper, and working the mixture as is done with sea biscuits.—*Journal de Chimie Medicale* January, 1852.

ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.

Improvements in the manufacture of oxalate of potash. GEORGE JORDAN FIRMIN, of Lambeth-street, Goodman's-fields, manufacturing chemist. Patent dated June 24, 1851.

These improvements consist in manufacturing oxalate of potash by employing oxalic acid and water to act on salts of potash, such as the tartrate, sulphate or muriate of potash.

When tartrate of potash is the salt employed, the patentee takes cream of tartar, and neutralizes the excess of acid contained in it by the addition of carbonate of lime; he thus obtains a neutral tartrate in solution to every 100 lbs. of which he adds 60 lbs. of crystallized oxalic acid dissolved in water. This quantity of acid is sufficient to combine with about half of the potash; the remaining half being acted on by the liberated tartaric acid and converted to tartrate of potash, which may serve for a subsequent operation, or may be purified by passing its solution through animal charcoal. The neutral oxalate of potash is subsequently treated by adding a sufficient quantity of oxalic acid to convert it to a superoxalate, which is filtered, evaporated, and crystallized in the ordinary manner.

In operating on sulphate of potash the patentee dissolves it in water, heated to about 180° Fahr., and to every 100 lbs. thereof he adds 160 lbs. of crystallized oxalic acid dissolved in water, or a sufficient quantity of oxalic acid to convert the potash of the salt into superoxalate of potash (sulphuric acid being liberated). He then stirs the mixture well, keeping up the temperature to about 180° Fahr., and allows it to cool, when the superoxalate of potash will be found adhering to the sides and bottom of the vessel. It is subsequently dissolved, filtered, evaporated and crystallized in the usual manner.

When muriate of potash is operated on, the patentee dissolves it in water, heated to about 180° Fahr., and having added to every 100 lbs. thereof 140 lbs. of crystallized oxalic acid dissolved in water, or a

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sufficient quantity of acid to convert the potash of the salt to a superoxalate, he proceeds as above directed when operating on sulphate of potash. The muriatic acid resulting from the process may be utilized by evaporating the liquor left in the vessels after the crystals of superoxalate of potash have been removed, and the residue of the evaporation may be returned to be again operated on with fresh quantities of muriate. In order to prevent the escape of muriatic acid, it is recommended to conduct the operation in a closed vessel (which should be composed of earthenware, although lead vessels may be used when operating on the tartrate and sulphate of potash), having a pipe leading from it to another vessel containing water, by which the water will be absorbed.

Claim.—The manufacture of oxalate of potash by employing oxalic acid and water to act on salts of potash as described.

Improvements in dyeing and in the preparation of dye-woods. JOHN BRAZIL, of Manchester, gentleman. Patent dated June 24, 1851.

The *first* part of this invention consists in using soap or saponaceous matter in water, in order to facilitate the extraction of the coloring principles from madder, garancine, or other dye stuffs in the act or process of dyeing. The proportions which the patentee prefers to employ are half a pound of soap (palm oil soap by preference) to every 10 lbs. of madder, with the usual proportions of ground chalk and water. It is recommended to enter the goods to be dyed at a temperature of about 70° to 80° Fahr., which should be gradually raised to 180°, when the goods are withdrawn. Or, instead of using the proportions of soap above mentioned, almost half or two-thirds of the soap liquors used for the first soaping of the fabrics may be employed, and in both cases the madder should be added before entering the fabrics in the dye-beck.

The *second* part of this invention consists in using a solution of borax or borax combined with soap, for the purpose of more readily extracting the coloring principles from madder and other dye stuffs while in the act of dyeing. When borax is used alone, the proportion is ½ lb. to 12 lbs. of madder, and when soap and borax are employed together a quarter of a pound of each are added to 10 lbs. of madder, the usual quantity of ground chalk being introduced in either case.

The *third* improvement consists in saturating piece goods previous to applying a mordant, with a solution of soap in water which must be dried in the goods before the mordant is applied. For this purpose the patentee makes a solution of 1 lb of soap in 12 gallons of water, which will be a proper strength when the goods are entered in a dry state; but when the goods are entered direct from the bleaching vat in a wet state, a liquor of greater strength will be found necessary. The fabrics having been submitted to this operation, are dried and then dyed in the usual manner. Another liquor adapted for the same purpose is composed by adding to the soap water from the soap vat as much resin as it will readily dissolve; this liquor is used in the same way as the former one. A third liquor consists of water to which has been added for every six gallons one pound of borax with as much resin as it will conveniently dissolve.

The *fourth* part of the invention consists in using a solution of soap in water, or of borax alone, or combined with soap, in order to facilitate the extraction of the coloring principles from dye-woods and dye stuffs, the quantity of the above ingredients employed depending on the nature of the dye liquor required to be produced, and the dye-wood which may be under operation.

Improvements in separating silver from other metals. ALEXANDER PARKES, of Birmingham. Patent dated June 24, 1851.

These improvements consist in extracting silver from lead by the use of zinc, and in separating the silver so extracted from the zinc employed for that purpose.

In the specification of a former patent dated June 11, 1850 (see Mechanics' Mag. vol. liii. p. 406), Mr. Parkes described a method of extracting silver from lead ore, by melting the lead and then using zinc in a melted state to combine with the silver contained in the lead. The present improvements consist in employing quantities of zinc varying with the quantities of silver contained in the lead ore under operation. For ore containing 14 oz. of silver to the ton, one part of zinc to every 100 parts of ore will be found a good proportion. This proportion must be varied with the quantity of silver present: thus, there will be required

	Silver.	Zinc.
For a ton of lead ore containing	14 oz.	22·4 lbs.
Ditto . .	21 ,,	33·6 ,,
Ditto . .	28 ,,	44·8 ,,

and so on.

The lead having been melted, and its

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temperature raised to the melting point of zinc, the zinc is introduced, and after being well mixed, time is given to allow the zinc and silver to rise to the surface, and when the metal begins to set, the zinc is skimmed off, and placed aside for the purpose of having the silver extracted from it. The lead which has been thus desilverised will be found to contain a small proportion of zinc, and as this would act prejudicially on the metal, it may be removed by running the lead into a reverberatory furnace, and maintaining a low heat until the zinc is oxidized and rises to the surface; the lead is then tapped off, and the oxide of zinc removed from the furnace by any suitable means. This operation will occupy from two hours to two hours and a quarter, supposing the quantity of lead to be about three tons and the surface about 25 to 30 square feet.

In order to separate the silver from the zinc and lead with which it is combined, it will be necessary to concentrate the alloy, and this is done by placing it in an iron pot perforated at the bottom, and applying a low heat so as to melt out a portion of the lead; the lead which is thus melted out may be melted again with a fresh quantity of ore to obtain any portion of silver which it may still contain. The concentrated alloy may then be submitted to a low heat, so as to oxidize the zinc and admit of its being dissolved out by muriatic or sulphuric acids, leaving the silver to be subsequently treated in the ordinary manner. Or it may be distilled in a retort, such as is used in the manufacture of oxide of zinc, so as to obtain the zinc in a metallic state, and admit of the silver being separated by cupellation from the small quantity of lead and impurities remaining combined with it. When performing this distilling operation, it will be found advisable to add to the zinc and silver alloy a small quantity of carbon to reduce any oxide which may be present.

New application of certain fluids for manufacturing extracts applicable to the processes of dyeing, printing and tanning, and in the apparatus connected therewith. FREDERICK CRACE CALVERT, of Manchester, chemist. Patent dated June 12, 1851.

The first part of this invention consists in the employment in the manufacture of extracts to be used in dyeing, printing and tanning, of certain fluids not hitherto used, which it is essential should possess the two following properties; first, they should be easily transformable into vapor and recondensed with facility; and, second, they should be enabled by their chemical composition to dissolve with facility the coloring or tanning matters, or principles from the substances in which they are contained, and should also be similarly capable of dissolving resins and the resin of gum resins.

The fluids suitable for the purpose are those which are rich in carbon and hydrogen, or are composed entirely of carbon and hydrogen, such as the impure hydrate of oxide of methyle, or as it is commonly called, wood-naphtha, pyroligneous spirit, acetone, or the hydrate of oxide of mesithyle, turpentine, camphine, the volatile oils obtained by the destructive distillation of resins, the volatile oil of shale coal, and other bituminous shale, or schist, also the volatile carburetted hydrogens obtained by the distillation of coal tar, usually known as coal, or mineral naphtha; also those obtained by the distillation of vegetable tars, and from bog or peat, or from tar and oil obtained from bog or peat, and lastly, alcohol and ethers, such as the hydrate of oxide of ethyle, the acetate of oxide of ethyle, or other varieties of ethers.

The second part of the invention has relation to the apparatus employed for manufacturing extracts from substances containing coloring or tanning principles, or matters, by the use of the volatile fluids above enumerated, or any of them. The apparatus consists of two oblong boxes for holding the substances to be operated on. These boxes are lined with copper and divided into compartments by partitions of about half their depth; they are also constructed with perforated false bottoms, beneath which are arranged steam pipes, and are provided with doors to admit of the materials being introduced and removed. Each of the boxes is in communication with a close boiling pan or evaporator, and also with a receiver (a vessel of the same length as the boxes and placed underneath them), from which latter a pipe leads to the boiling pan. From the boiling pan rises a vertical pipe enclosed in a steam jacket, for the purpose of preventing the condensation in the pipe of the vapors rising from the boiler, which pipe leads to a condenser, placed above the operating boxes and communicating with a reservoir also above the boxes for the supply of liquid to them when the working of the apparatus is commenced. A separate condenser is also provided, which communicates by suitable pipes with cones placed in the top of the operating-boxes which act as still heads. The method of operating is as follows:— The materials from which the coloring or tanning matters, or principles, are to be

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extracted, are supplied to one of the boxes (which to save time, are used alternately), either in a dry or moist state, (being moistened, when this method of proceeding is adopted, with water or with solutions of the fixed alkalies, such as potash, soda, or ammonia, or with solutions of alkaline carbonates, or bicarbonates, phosphates, borates and sulphates of soda and potash, stannates of soda and potash lime, carbonate of lime, baryta, strontia, and their carbonates, magnesia and its carbonates, or oxide of lead. The alkalies and substances presenting an alkaline reaction may also be added in a dry state. It will be sometimes found necessary to treat substances from which extracts are to be made previous to putting them into the boxes by washing or macerating with one of the above alkalies, or alkaline materials dissolved in water), they are then spread evenly over the surface of the box and the volatile fluid is admitted from the reservoir, or it may be introduced in the state of vapor direct from the boiling pan, and condensed by contact with the materials under operation. After maceration for a few hours, the fluid is let off into the receiver, and thence to the boiler, carrying with it a certain portion of the coloring or tanning matter; the fluid is then volatilised, leaving behind it the portion of tanning or coloring matter which it has extracted, and rising through the vertical pipe is condensed in the condenser and returned to the reservoir for use over again, and the operation is repeated until the whole of the tanning or coloring principle is supposed to be extracted. Should any portion of the volatile fluid remain in the exhausted materials, it is volatilized by steam caused to circulate through the steam pipes in the boxes, and passing away through the conical still-head, is condensed in the detached condenser before mentioned, from which it is removed and supplied to the reservoir to be used over again. Or the operation may be completed by introducing water into the boxes after repeated use of the volatile fluid, for the purpose of combining with any of the said fluid, and any remaining portion of coloring or tanning matter which the substances under operation may contain. The liquid resulting from this operation is conducted to the boiler, and mixed with the extract contained therein. The extract when drained off from the boiler may be diluted with water, or employed at once in the state in which it is so withdrawn. When sumach is the material operated on, wood naphtha is the fluid which the patentee prefers to employ for extracting its tanning principles; the quantity of naphtha used will be determined by experience and the nature of the extract required, so also when other materials than sumach are operated on, the nature of the material, and the use to which the extract is to be applied, will readily enable any practical chemist to determine what volatile fluid, and what quantity thereof, will be under the circumstances most suitable.

Another method of operating on such substances as above mentioned, consists in employing, instead of the apparatus described and a volatile fluid, an alkali or substance presenting an alkaline reaction. When this method is adopted, the substances containing the tanning principle or matter are treated by maceration or percolation, either with or without the aid of heat. The operation may be conducted in open vessels, but the patentee prefers the use of closed, or partially exhausted vessels, as it is well known that tannin and gallic, or pyro-gallic acids undergo rapid oxidation or destruction by their absorption of oxygen from the atmosphere, when under the influence of alkalies. It will also be found advantageous to add to these extracts a sufficient quantity of some organic or mineral acid to neutralize the quantity of alkali, alkaline earth or carbonate employed, and to give a slight acid reaction to the solution in which such alkaline substances have been used.

In conclusion, Mr. Calvert observes, that the form of apparatus employed is not material, provided it complies with the conditions that the volatile agents used to extract the coloring or tanning matters or principles are made to pass through the substances containing the same, and in passing to extract a portion of the said coloring or tanning matters, from which they are liberated by the application of heat, the agent employed being volatilized and rising through a tube or aperture to be condensed, and then again passing through the substances to be operated on, and the process being repeated as often as necessary.

Claims.—1. The application of the before named volatile fluids for the manufacture of extracts from substances containing coloring and tanning matters or principles, which extracts are applicable in the processes of dyeing, printing, and tanning.

2. The apparatus described for the manufacture of extracts applicable to dyeing, printing, and tanning, by which apparatus the volatile fluids enumerated, or any others possessing the same or similar qualities, are volatilized (leaving the coloring or tanning-matter or principle in the evaporating ves-

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sel), and then condensed and employed in the manner described.

3. The use of the before-named alkalies, or substances having an alkaline reaction when mixed with substances containing coloring or tanning matters or principles, previous to the subjecting them to the action of volatile fluids.

4. The manufacture of extracts from substances containing tanning matters or principles by the agency of alkalies, or substances presenting an alkaline reaction.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

POISONING BY PHOSPHORUS.—NORMAL PHOSPHORUS.

BY M. E. COTTEREAU.

Poisoning by phosphorus is very uncommon; nevertheless, judicial annals furnish us from time to time with examples of it, and the facts connected with the history of a substance endowed with very singular properties, added to the occurrence of a discussion which has lately arisen at the *Société de Gannat* (Allier), on the subject of seeking for this body in cases of poisoning, has led us to suppose that our readers would with pleasure receive a summary of the toxicology of phosphorus.*

Among the substances essential to animal organism, phosphorus in the state of phosphoric acid combined with lime, is, without doubt, one of the most generally diffused; thus the abundance of this principle in the economy renders the fact of the administration of *normal phosphorus*, as a means of poisoning, difficult of proof. We are about to examine the state of the question, and we shall see if this objection is well or ill founded.

Before entering on the problem of the search for phosphorus, we will enumerate, in a few words, the phosphorised matters which may be used to perpetrate the crime of poisoning, and establish their various characteristics.—

I.—PHOSPHORUS.†

A solid, pulverulent metalloïd, in cylindrical sticks, or in regular or irregular masses, colorless and semi-transparent, sometimes black, or colored superficially more or less, sometimes white and sometimes red, with an odor which has been improperly compared to that of garlic, but which is *sui generis*: luminous in the dark, fuming in the air, absorbing oxygen from the latter, and becoming transformed into phosphoric acid; fusible at 112° F., and may be distilled without alteration at 554° F., provided that it is kept out of contact with the air, without which precaution it burns quickly, giving out abundant vapors of phosphoric acid, which cause coughing, and which, collected in distilled water, furnish with lime water a white precipitate soluble in an excess of acid liquid, in a similar manner to phosphorous acid, but which is distinguished from the vapors produced by this last, inasmuch as the water which holds them in solution does not precipitate nitrate of silver, and gives with the same reagent a yellow or white precipitate, soluble in nitric acid, and in ammonia, when it has been previously mixed with a small quantity of soda, whereas water charged with the vapor of phosphorous acid gives rise, by the application of heat, to a disengagement of phosphuretted hydrogen, furnishes with nitrate of silver a black or whitish precipitate becoming black by agitation, and decolors, with the aid of heat, the persulphate of manganese.

II.—PHOSPHURETTED AQUEOUS SOLUTION.*

Odor similar to that of garlic, luminous in the dark, forming with nitrate of silver a brownish yellow precipitate of metallic phosphorus, becoming black.

* Phosphorus being sold as a paste under the name of *mort aux rats*, has been used in several cases of poisoning: the work of M. Cottereau is therefore of practical importance.

† Without speaking of accidents occasioned by this substance, we will quote: 1st, The case of poisoning reported by M. Worbe to the *Société Médicale d'Emulation* 1825; 2nd, that mentioned by Julia de Fontenelle in the *Revue Médicale*, 1829, t. iii, p. 429: 3rd. that inserted in the *Journal de Chimie Médicale*, 1850, 3rd series, t. vi, p. 73. (See The Chemist, New Series, vol. i, 1849-50, p. 376.)

* As indicated by M. Soubeiran, in his *Traité de Pharmacie*, this preparation of phosphorus, the same as all the others, alters quickly in the air, producing phosphorous acid. This fact has been likewise mentioned in the *Dictionnaire de Médicine et de Chirurgie*, in the article Phosphorus, by M. Martin Solon, who attributes to the production of this acid the very serious accidents which sometimes follow the administration of phosphorised preparations, badly preserved or long after preparation.

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Finally, MM. Weigel and Krugg of Cassel, fully confirmed these assertions by the comparative experiments which they made for the purpose of proving the remarkable differences of action often observed in the administration of officinal phosphoric acid. These practitioners, in fact, were led to conclude, that the internal use of *pure* phosphoric acid does not occasion any caustic action, notwithstanding the weakness of the animals, whereas the same acid, containing phosphorous acid in consequence of the manner in which it has been prepared, occasions very serious symptoms, as, for example, a gangrenous phlegmasia of the mucous membrane of the stomach.

III.—PHOSPHURETTED ALCOHOLIC SOLUTION.

Odor of alcohol and phosphorus; rendering water milky, and luminous if the operation takes place in the dark; producing a black precipitate with nitrate of silver, burning with a white flame than that which results from the combustion of alcohol, diffusing white vapors of phosphoric acid immediately after the combustion has ceased, and, in cases where the solution has been very concentrated, leaving a layer of red oxide of phosphorus round the sides of the vessel in which the combustion took place.

IV.—PHOSPHURETTED ETHER.

Odor of ether and phosphorus, forming a black precipitate with nitrate of silver, burning in the same manner as ether, and presenting after combustion the same phenomena as phosphuretted alcohol.

V.—PHOSPHURETTED ACETIC ACID.

Diffusing white vapors in contact with the air, becoming colored or forming a black precipitate with nitrate of silver, according to its concentration; odor of acetic acid and garlic.

VI.—PHOSPHORISED OIL.

Odor of garlic, fuming more or less in the air, according to the quantity of phosphorus which it contains; forming a black precipitate with nitrate of silver, and diffusing, by the application of a slight heat, white vapors of phosphorous acid.

VII.—PHOSPHORISED POMADE.

Odor of garlic, becoming black by trituration with nitrate of silver; reproducing, by boiling with alcohol, the above described phosphuretted alcoholic solution.

VIII.—Besides the phosphorised compounds of which we have just spoken, there have been used as poison, *phosphorised pastes*, intended for the destruction of noxious animals, such as rats, mice etc.; as well as the paste which is used in the manufacture of Lucifer matches. It is difficult to assign to these pastes any very distinct characteristics, as their composition is variable. Whatever it may be, it is always easy to isolate the phosphorus, either by fusion, by volatilisation or by solution.

IX.—Finally, we meet with cases of asphyxia by means of phosphuretted hydrogen, a gas possessing an extremely fetid and characteristic odor; sparingly soluble in water, very poisonous, by reason doubtless of the great state of division in which it presents the phosphorus; inflammable at 212° F., decomposing by combustion into water and phosphoric acid; often inflaming spontaneously in contact with the air and at the ordinary temperature, but it then contains a small quantity of a phosphuret of hydrogen, containing less hydrogen than it and in a liquid state, which communicates to it this extraordinary property. This gas, is, moreover, absorbed by the metallic solutions of copper, silver, and mercury, in which it causes the deposition of phosphurets.

This done, if we pass in review the observations made by Weickard, Zessler, Lœbestein-Lœbel, Brera, Hufeland, Lausk, Worbe, Dieffenbach, Bouttatz, Rielle, Giulio, Orfila, Muzetti, Martin-Solon, etc., we may consider that phosphorus acts on the animal economy in the following manner:—

1st. Solid phosphorus when applied externally, may produce, by its combustion, very serious cauterisations and burns.

2nd. Introduced into the economy in solution, and in small doses, it is absorbed, produces a powerful excitement of the nervous system, and particularly of the organs of generation.

3rd. In the dose of 53, 106, 159 or 212 milligrammes, (1, 2, 3 or 4 grains), it may cause death, whether dissolved in any vehicle whatever, or introduced in the solid state.

4th. In this last case it appears to act as a corrosive, and causes inflammation of the gastro-intestinal mucous membrane.

5th. Finally it acts the more powerfully the more it is divided,* and it appears to be

* A fact which corroborates this mode of action has been observed by M. Tillois, pharmacien at Dijon, and was reported by him to the Academy of Sciences on the 18th February, 1833. M. Tillois having caused a cat to swallow a cylinder of phosphorus weighing 10 centigrammes, what was his surprise, when he found the next day in the excrements an almost equal quantity of the substance taken, without the animal appearing the least in the world incommoded.

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transformed in the stomach and intestines into phosphorous acid, which inflames the tissues.

Now supposing that we had to deal with a person poisoned with phosphorus, let us see how we should prove this poisoning.

When we have to observe the phenomena developed after the administration of phosphorus, we may note the excitement produced in the nervous system, and particularly that of the urino-genital organs. We remark a general heat, a rapidity of the pulse, an acceleration of the respiration, accompanied by vomitings which smell more or less of phosphorus, abundant perspiration and urine, colored, odorous, sometimes luminous in the dark. The muscular strength is augmented and the venereal desires are rendered violent. When the phosphorus has been administered in a vehicle like alcohol or ether, its combustion becoming more rapid, white vapors issue from the mouth and nostrils.* The pains are then excessive, the vomitings obstinate, and death follows in the midst of horrible convulsions, whether it results from the absorption of the phosphorus, or from a local phlegmasia caused by this poison. In the autopsy, the intestinal mucous is found inflamed, sprinkled with black or slate-colored stains, sometimes gangrened or perforated. According to Julia de Fontenelle, (*Revue Médicale*, 1827, t. iii, p. 429), similar stains may be found in various parts of the body and even in the lungs. It will be easily conceived that in a case of asphyxia by phosphuretted hydrogen, these last organs will present many of these stains. In some cases the flesh and the gastric organs have the odor of phosphorus, and are luminous in the dark.—*Journal de Chimie Médicale*, Dec. 1851.

(*To be concluded in our next.*)

* Magendie, *Experiences pour servire à l'histoire de la respiration pulmonaire*; a memoir read to the Institute in 1811, p. 19.

NOTE ON SOME PHARMACEUTICAL PREPARATIONS OF ULMARIA, (SPIRŒA ULMARIA).

BY M. P. H. LEPAGE, PHARMACIEN AT GISORS.

Dr. Tessier, of Lyon, having established the diuretic properties of this plant, which was last year extolled as a complete remedy for certain dropsical affections, by a priest of the Haute Marne, who wrote to the Academy of Sciences concerning the properties which he had discovered in the queen of the meadows; it has appeared to me that it might be useful to compose some pharmaceutical formulæ for the employment of this plant, which the recent expements of Dr. Tessier, have probably drawn from the oblivion in which, perhaps wrongly, it has long been buried.

A Belgian pharmaceutist, M. Bonnewyn, it is, true has recently published formulæ for the prepartion of a syrup and tincture of ulmaria, but we think that his preparations leave something to be besired; 1, because they contain too small a proportion of the plant: 2, because the modus faciendi of his syrup, having regard to the principles which the queen of the meadows contains, does not appear to us conformable to the rules of the art of pharmacy.

We may also remark that M. Bonnewyn employs for his preparations only the summits of ulmaria, whilst we think it proper to employ the entire plant: finally he has omitted to mention whether he used fresh or dried summits.

Before describing the formulæ which we have tried and which we think rational, we will remark that the ulmaria is a plant which contains little water of vegetation, and that, if it were desired, it would scarcely be possible to extract the juice from it to give it any pharmaceutical form whatever. We have proved, indeed, that it lost scarcely half of its weight by desiccation, and it is known that very few plants are like this.

It was the dried plant which we used for preparing the formulæ which we propose, because we ascertained that desiccation, really deprives it only of its water of vegetation.

It is known, moreover, that the complex volatile oil which it gives when submitted to distillation, is formed only under the influence of water (Pagenstecher).

The infusion of spiræa is colored black by sulphate of iron, and is precipitated abundantly by the solution of tartrate of potassa and antimony, which would seem to justify the astringent properties attributed to it by Lemery.

A strong decoction of ulmaria which remains transparent so long as it is hot, becomes turbid when it is cold; in the latter state, if heated, it again becomes transparent. It is evident that in this case, the decoction of queen of the meadows acts absolutely like cinchona.

According to the foregoing data, the following are the formulæ for the employment of this plant which we think we should submit to the sanction of competent men:—

DISTILLED WATER OF ULMARIA.

	grammes.
Dried and well preserved flowered summits.....	1,000

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Cold water sufficient to cover the plants.

Macerate for twelve hours, and distil to obtain 2,000 grammes of product.

The hydrolate of ulmaria possesses an agreeable aromatic odor and is certainly endowed with medical properties, either calming or antispasmodic, which deserve being turned to account. Ammonia, and the other caustic or carbonated alkalies communicate to it a very deep greenish-yellow color; the salts of iron* develope in it a very intense violet red, a character which belongs, as is known, to the spiroylic acid (salicylic acid of Piria) which it contains.†

EXTRACT.

	parts.
Dried ulmaria (leaves, stems and flowers) in coarse powder	1
Alcohol at 25 (56 cent.)	6 to 7

Macerate for six or eight days, at a temperature of a least 86° F., agitating frequently, then pressing and filtering.

Distil the liquor over a sand-bath to extract the spirituous portion, then evaporate the residue by steam to the consistence of an extract.

SYRUP.

	grammes.
Ulmaria (leaves, stems and flowers)	900
Cold Water.....	q. s.

Macerate for a few hours, and distil to obtain 1,000 grammes of liquor.

On the other hand:

Evaporate over a sand-bath the decoction in the alembic until it is reduced to the weight of 600 grammes.

Filter whilst hot, add it to the aromatic water, and dissolve, in a close vessel, at the heat of the sand-bath, in the two liquors combined:—

	kil grammes.
Sugar	2 · 900

This syrup contains the principles of one-sixth of its weight of ulmaria.

The queen of the meadows, giving one-fourth of its weight of extract, the syrup of ulmaria might also be prepared according to the following formula:—

	kilogr. grammes.
Very aromatic distilled water of ulmaria	1
Hydro-alcoholic extract.....	130

Dissolve the extract in the hydrolate filter and add:—

	kil grammes.
Sugar	1 . 900

Make a syrup by simple solution, in a close vessel on the sand-bath:—

ELECTUARY.

	parts.
Powder of queen of the Meadows	1
Honey.....	2
Syrup of ulmaria q. s. (about	1½

F. S. A. an electuary.

TINCTURE.

	parts.
Coarse powder of ulmaria	1
Alcohol at 56° Cent	4

macerate for 15 days, strain with pressure and filter.—*Repertoire de Pharmacie*, December, 1851.

* The salts of protoxide of iron free from salts of peroxide not being colored by contact with the liquor of ulmaria, as I have ascertained, it might be employed as a very delicate reagent for detecting the presence of the latter in the former.

† Having submitted separately to distillation the stems and leaves of the queen of the meadows, I have proved that both gave a hydrolate of analagous odor with that to that which is obtained with the flowers, but much less sweet; the hydrolate of the stems contained a little spiroylic acid, since it took a slight violet tint on the addition of sulphate of iron; on the contrary, that of the leaves contained none, for it was not in the least affected by the same reagent.

ON THE TREATMENT OF INTERMITTENT FEVER BY LARGE DOSES OF QUININE.

BY DR. MEYER, BERLIN.

Dr. Pfeuffer, in *Hœnle and Pfeuffer's Zeitschrift*, has published a paper having for its object to show that simple intermittent fever may be cured by a single large dose (ten grains) of quinine, administered on the day that the paroxysm is absent: and that this dose is not followed by any evil effects. With this view, Dr. Pfeuffer adduces thirty-four cases of quotidian and tertian intermittent, treated between the 4th of May and 7th of August, which cases varied in their duration from four days to three months. In these, no return of the fever had been observed after the administration of the ten-grain dose of quinine; whereas, although ague is not endemic or peculiarly obstinate in Heidelberg, from forty to a hundred and twenty grains have usually been required in the ordinary treatment of cases of intermittent fever. Dr. Pfeuffer at the same time gives his patients a diet of soup, fish, flesh, vegetables, and wine.

These observations, Dr. Meyer remarks, correspond with the statements of Torti in 1709; and of Piorry and Bretonneau in 1845; and Bittner in 1850; also with the results of his own experience in six cases in which he had adopted the same treat-

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ment. Furthermore, from the end of November, 1850, to the first of January, 1851, twenty-eight soldiers suffering from intermittent fever were treated with quinine in ten-grain doses, given from five to ten hours before the paroxysm; in these cases the fit was arrested: a nutritious diet of meat and beer was supplied. Of these twenty-eight cases, none were quotidian, three were tertian, and twenty-five were quartan agues. The duration of the disease had varied from a fortnight to eighteen months. The patients had most of them previously taken quinine or arsenic without benefit. Eight of these patients had resided in the fortifications at Posen, which are situated at a high elevation, but deficient in light and air; they had the quartan form of the disease, and had received no benefit in the military hospital: in all, without exception, the spleen and liver were enlarged; these individuals exhibiting an anæmic, cachetic aspect, with sallow complexion, and œdema of the face and ankles. The prognosis in these cases was most unfavorable; but the attack was suppressed by the ten-grain doses of quinine for eight, fourteen, twenty-one, and twenty-eight days, until at last the health was perfectly restored by the subsequent employment of ammoniated tincture of iron, a liberal diet, and fresh air.

Of the remaining twenty cases, three were tertians, which severally had existed fourteen days, three weeks, and three months; thirteen were quartans, of which two had lasted two months; four three months; one twelve months; one eighteen months; these were cured by a single dose of ten grains of quinine: one quartan of three weeks' duration, and one of four months' standing, were cured by a second dose. Two cases remained rebellious; one, that of a pale, feeble individual, with splenic disease; the other, a robust man, with only moderate enlargement of the spleen. Among the sixteen who were cured by the first dose of ten grains, two were remarkable; one was a strong, healthy-looking man, who had the disease eighteen months, with slight enlargement of the spleen; the usual effects followed the administration of the large dose of quinine, and so far were evidence of perfect cure; at the same time that painful dragging of the limbs, from which he had suffered during the entire progress of the disease, suddenly disappeared; and the other, a patient in a lax, anæmic condition, which had existed for twelve months, with an enlarged liver, and a spleen more than seven inches broad. It was for the treatment of the latter disease that the patient had been consigned to the hospital. A full dose of quinine, with liberal diet, had suppressed the fever during the time that he remained in hospital, and had effected a diminution of the spleen. The cure was permanently effected by a full diet, and the internal use of iron.

Dr. Meyer concludes, as the result of his observations, that Dr. Pfeuffer's plan of giving a single large dose of quinine, though not uniformly successful, is successful in the majority of cases of uncomplicated quartan ague where no special endemic influence or altered condition of the blood interferes. The subsequent employment of iron as a medicine, and a nutritious full diet, secures the continuance of the benefit. The statement of Dr. Pfeuffer, that no ill effects follow the use of a large dose of quinine, is also confirmed by Dr. Meyer.—*Casper's Woehenschrift.*

MEANS OF DETECTING THE PRESENCE OF THE RESINS OF JALAP, GUAIACUM AND COLOPHANE IN THE RESIN OF SCAMMONY.

BY M. THOREL, OF AVALLON.

In giving it as my opinion that Scammony should be employed in therapeutics only in the state of resin, I certainly meant that this resin should be prepared by the Pharmaceutist himself, for the requirements of his own establishment.

However, in cases wherein it would be an utter impossibility to do so, and in which, consequently, it would be necessary to bring the resin of scammony, it is necessary that pharmaceutists should know how to assure themselves of its purity.

For the fraud to pass unperceived, the substance added must be in only very small quantity, or else it must have nearly the same mode of action. In this last case, it might be the resin of jalap, as being least expensive and almost as active, which has been employed for the adulteration; it would not be the less culpable, since the substitution of one medicine for another is always an act of bad faith.

I propose, for detecting this fraud, a process based on one hand on the absolute insolubility of the resin of jalap, in rectified sulphuric ether, and, on the other hand, on the solubility of the resin of scammony in that liquid in all proportions.

Other, and more culpable adulterations might be attempted, as by the addition either of resin of guaiacum, colophane or other inert substances.

Resin of guaiacum would be easily de-

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tected by using the gummy solution which I have pointed out as one of the most certain reagents (Repertoire de Pharmacie, Vol. IV, 1848) or also by the employment of nitrous gas or chloride of mercury.

Several reagents are capable of detecting the presence of colophane or pitch resin in the resin of scammony. In the first place essence of turpentine, which dissolves colophane at the ordinary temperature, and leaves the resin of scammony almost in contact.

But the most certain reagent for this purpose is sulphuric acid; it possesses the property of dissolving several resins, modifying their composition more or less. If a small quantity of this acid be poured on colophane, a very intense red color is manifested immediately and by simple contact; the same acid poured on pure resin of scammony produces, on the contrary, no immediate change, and it is only after some minutes and in contact with the air, that it is colored and that but feebly, of a wine-ley color; whilst, in the former case, the color is of a very deep scarlet.

By this means one-twentieth of colophane may be recognised in the resin of scammony; it is sufficient, for the purpose to pour on 25 to 30 centigrammes of resin put into a glass or porcelain mortar, from 4 to 5 grammes of commercial sulphuric acid, and to give it one turn of the pestle. If the resin of scammony contains colophane, the mixture will turn red immediately on contact; if the resin of scammony is pure, on the contrary, the liquid will take more time to become colored.

Doubtless, means will likewise be discovered of detecting the adulteration of this resin with other substances.=*Repertoire de Pharmacie.*

ON THE PRODUCTION OF CHLOROFORM BY MEANS OF CHLORIDE OF LIME AND ESSENCE OF TURPENTINE.

BY M. J. CHAUTARD.

I HAVE the honor of communicating to the Academy the result of some researches on the action of hypochlorite of lime on essence of turpentine.

By mixing intimately in a retort 600 parts of water, 200 of chloride of lime, and 25 of essence of turpentine, and submitting the whole to distillation, a very violent reaction is manifested, and at the same time a very agreable ethereal odor is perceived. A great quantity of carbonic gas is disengaged, which, by swelling the matter, renders it necessary to employ a sufficiently large vessel. The retort being removed from the fire as soon as the swelling commences, the operation will proceed well and continue of itself until the end. In the receiver will be found three layers often intermingled: the upper one is some of the essence which appears to have escaped the reaction; the lowest, an ethereal liquid the odor of which, in every respect, resembles that of chloroform; the intermediate one is water holding in solution a considerable quantity of the preceding product. The last is separated by means of a pipette and rectified on a sand-bath; two or three treatments with chloride of calcium and several fractioned distillations suffice to render it perfectly pure.

Thus obtained, this product presents the properties and composition of the chloroform of the methylic series.

It is a perfectly colorless liquid, very mobile, with a very sweet taste, and a very agreeable odor, heavier than water in which it is distinctly soluble, imparting to it the two preceding properties; finally it boils at 145° F.

Submitted to analysis, this substance gave me the following composition

C=10·47, H=1.03 and Cl=88.59

calculation gives

C=10·05, H=0·84 and Cl=89.11

I think that the slight excess of carbon and hydrogen obtained should be attributed to a small quantity of carburetted hydrogen which obstinately accompanies chloroform, and of which it might, perhaps, be freed by distillation over sulphuric acid. This remark will at the same time account for the difference in the boiling point of this matter and that generally admitted for chloroform.

I have no doubt that some modification of the above-mentioned process, with which I am now occupied, would enable me to obtain chloroform in a sufficiently economical manner, to render advantageous the substitution of this mode for the one in ordinary use.—*Comptes Rendus*, No. 24, Dec. 15th, 1852.

ON THE SODA-PYROPHOSPHATE OF IRON.

BY ALEXANDER URE, ESQ., SURGEON TO ST. MARY'S HOSPITAL.

MY attention was attracted some time back by an ingenious paper of Mons. Persoz on the double pyrophosporic salts, published in the *Annalen der Chemie und Pharmacie*

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for 1848. In the latter part of that paper, the author expresses an opinion that the pyrophosphoric salts are likely to prove of importance as medicinal agents. It is well known that iron is rendered very eligible for internal use, if administered in the form of a triple salt, as when combined, for example, with tartaric acid and potassa; because the iron then is no longer precipitable by the alkaline hydrate. It would appear, however, that the soda pyrophosphate of iron is in many respects superior as a medicine to the triple salts into which the vegetable acids enter. Thus, the pyrophosphoric salt, from being saturated with oxygen, cannot in passing through the system absorb more, whereas, the latter salts under like circumstances, are constantly undergoing a process of combustion, according to Millon; and by withdrawing oxygen in this manner, must necessarily impair the efficacy of the oxide of iron as an oxydising agent. It deserves notice, moreover, that the constituent ingredients of the soda-pyrophosphate of iron are to be found in the organism.

I have prescribed this salt to various patients, and found it act as a mild but efficient chalybeate. One little scrofulous girl, now under my care in St. Mary's Hospital, for disease of the hip-joint, has taken it in solution during several months with the best effect. The remedy was accurately prepared by Mr. Blyth, dispenser to the hospital, according to the subjoined directions of Mons. Persoz: 32·5 grammes of green sulphate of iron in crystals are to be mixed in a porcelain capsule with 5 grammes of sulphuric acid, 30 grammes of water, and as much nitro-muriatic acid as will suffice to effect the oxidation of the protoxide of iron. The above mixture is to be evaporated to dryness in order to get rid of the free acid, and then treated with water to the amount of one litre. From 107 to 110 grammes of crystallised pyrophosphate of soda are to be dissolved likewise in a litre of water, of course in a separate vessel. The two solutions are next to be mixed together, and provided the iron solution have been rightly prepared there will be no precipitate whatever.

Each litre of liquid will contain as much iron as 16·5 of the green sulphate.

This solution is not affected by dilution with rain or distilled water, but from being faintly alkaline, is rendered slightly turbid on the addition of water impregnated with lime.—*Pharmaceutical Journal.*

TEST FOR GUAIACUM.

BY M. TH. HUBAUT, PHARMACIEN, PARIS.

NOTWITHSTANDING the low price of guaiacum, and, perhaps, on account of the lowness of its price, it is very difficult to find this wood in commerce, as it is sold ready rasped, unmixed with foreign matters; these are chiefly raspings of boxwood. Although this fraud has long been known and noticed, it still exists, owing to the absence of a prompt and easy means of detecting it. The following plan, which I have several times had occasion to put in practice, has perfectly succeeded; it is based on the property which the resin of guaiacum possesses of being colored blue by certain bodies. I employ in preference the chlorides of oxides, because with these products, which are found ready prepared in pharmaceutical establishments, the reaction is immediate.

The following is the mode of operating:—15 to 20 grammes of the guaiacum to be tested are put into a sufficient quantity of liquid chloride of soda, potassa, or lime to completely wet it. After a few seconds' contact, all the guaiacum takes a greenish tint, whilst the foreign woods, whether box or any other, retain their natural color. By then pouring off the excess of liquid and spreading the guaiacum on a sheet of paper, it is easy to determine approximately, at a single glance, the proportion of the fraud. I have tested in this manner samples of guaiacum containing more than half of their weight of foreign matters.

This process, as is evident, is only a prompt, instantaneous, application of the effect which light produces in a long time on guaiacum, and on this occasion I may mention that it was from seeing a fine flask of guaiacum stained green and yellow, which ornaments the front of the establishment of one of our brethren, that the idea of producing this result artificially occurred to me.—*Journal de Pharmacie*, December, 1851.

EMPLOYMENT OF OXYGEN GAS IN GLUCOSURIA.

BY M. BOUCHARDAT.

HAVING noticed an abatement of temperation of 1 to 2° Centigrade (1° 8′ F. to 3° 6′ F.) in patients powerfully attacked with glucosuria (Supplement to my Annuaire for 1846), and being impressed, moreover, with the beautiful observations of M. Chevreul on the influence of oxygen on the transformations of organic matters in

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the presence of alkalis, I conceived the idea of causing patients affected with glucosuria to respire oxygen gas. More than four years ago I made two experiments in which I proved the certainly beneficial influence of the inhalation of oxygen gas for facilitating in a patient whose urine contained only a small proportion of glucose, the complete destruction of this principle. I was stopped in these researches (which I was always desirous of resuming) by difficulties of execution which all those have met with who have wished to employ inhalations of oxygen in diseases.—*Comptes Rendus*, No. 20, November 17, 1851.

POISONING BY CHLORIDE OF BARIUM.

BY DR. C. WOLF.

A MEDICAL student who thought he had taken three spoonfuls of sulphate of magnesia, was seized with colic and vomiting; the pulse became feeble and irregular; the tongue retained its normal state. Dr Wolf, who was called in, thought at first that it was a case of cholera, caused by the purgative. Half an hour after it had been swallowed, the patient was cold in the extremities; pulse 65, irregular and feeble; the hands and feet motionless; the left eyelid was paralysed; voice feeble; perpetual colic: on examining what was left of the supposed sulphate of magnesia, Dr. Wolf found that it was chloride of barium. Immediately he administered sulphuric acid and castor oil, and this treatment speedily dispelled the colic; but the patient continued to suffer from retention of urine, which had to be drawn off.

The muscular prostration very soon disappeared, and at the end of three days, the patient was completely restored. He had taken 12 grammes of salt.

Dr. Wolf also detected the presence of the poison in the ashes of the dejections.

SYRUP OF BALSAM OF TOLU.

BY M. MARCEL.

MANY formulæ have been given. All give an aromatic and very agreeable syrup, but the preparation is very long. By operating in the following manner, we arrive at the same result and in a much shorter time.

Boiling simple syrup . .	2 kilogr.
Balsam of Tolu	125 grammes.

Pour the boiling syrup on the balsam of Tolu, cover the vessel, leave in contact for six hours, agitating from time to time and filter.

The same Balsam of Tolu may be used several times.—*Repertoire de Pharmacie*, December, 1851.

SOLUTION TO BE USED IN ITCH.

BY M. BODART.

	gram.
Arseniate of soda	1.20
Sugar	30
Dissolved in distilled Water	400
And rose water	100

With two frictions a day, a person suffering from itch is cured after six or eight applications.

This preparation is much easier to employ than the fatty matters used in such cases, the patients have not the inconvenience of being stained, and of giving off, during the treatment, a bad odor.—*Société de Pharmacie D'Indre et Loire.*

ARTIFICIAL MAGNET.

AT a late meeting of the Ashmolean Society, at Oxford University, Mr. Walker exhibited one of the artificial magnets manufactured by M. Elias, of Haarlem, of a very powerful nature, as to the amount of weight it would lift; and also remarkable for its virtue not being weakened by the sudden disruption of the keeper from the magnet, a quality not found in other magnets. M. Elias has obtained great celebrity by his magnets; the steel after being brought into the form of the bar, or horse-shoe, is passed through a coil of covered copper wire, one end of which is connected with the positive pole of a voltaic battery, and the other end to the negative pole, when in action, thus making it an electro-magnet, by the current of electricity passing through the wire. The magnet is moved backwards and forwards within the coil, and it is to be observed that the connection must be broken when the centre of the magnet is in the coil. The magnet exhibited by Mr. Walker was composed of three horse-shoe magnets, forming a compound one; its weight was about 10 lbs. or 12 lbs., and required 84 lbs. to separate the keeper from it.—*Mechanic's Magazine.*

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ON THE PREPARATION OF THE TINCT. FERRI ACET. P. D.

BY MR. THOMAS ARNALL.

THIS tincture frequently undergoes spontaneous decomposition by keeping, when made according to the directions given in the Pharmacopœia, a portion of the iron separating in the form of sesquioxide, leaving the tincture more or less decolorized. This decomposition appears to arise from the iron not becoming sufficiently oxidized by mere drying, especially in operating on large quantities. I have adopted the following modification with unvarying success:—To 6½ drams of sulphate of iron add a sufficient quantity of nitric acid and a little water, and apply heat until a perfectly clear and bright solution of persulphate and pernitrate is obtained; add, if necessary, liq. potass. carb. to neutralize any excess of acid, or until a *permanent* precipitate begins to fall: then dissolve 13 drams of acetate of potass in the liquid, and carefully evaporate to dryness. Rub the mass with two pints of rectified spirit of wine and filter. The result is a fine dark red permanent tincture. The nitrate of potass formed does not in any way alter the product, it being insoluble in the spirit.

REVIEW.

The Official Descriptive and Illustrated Catalogue of the Great Exhibition of the Works of Industry of all Nations. London: Spicer Brothers, and W. Clowes and Sons, 3 vols., 1851.

The object of the Work before us, is to preserve the recollection of the contents of the great hive of human industry and skill, termed "The Exhibition of 1851," and to render it further subservient to the instruction and mental entertainment of the present and succeeding generations.

Our readers must not look upon this Work as a mere catalogue, it is in fact an Encyclopædia of Commerce and Art, in which all the great manufacturers and produce of our own country and of foreign states, are fully described and elaborately illustrated. It is indeed a work not for a day, but for all time, a work which will prove an enduring record of the great industrial Congress, long after those who were engaged in its preparation have passed away. Such a work should be the companion of every man interested in the commercial progress of his country, and anxious to promote its success; he will also find in it a store of valuable information relative to the commercial productions of our foreign competitors, many of whom we now find are making more rapid progress than we were aware of, and all of whom will now be stimulated to renewed exertions in the industrial struggle.

We cannot conclude this brief notice of the Official Catalogue, without expressing our admiration of the superior style and getting up of the Work, which, whether as regards the descriptive or the illustrative parts, or its *toute ensemble*, is, like the Exhibition itself, one of the most extraordinary productions of the present day.

BOOKS RECEIVED.

The London and Provincial Medical Directory for 1852. London: John Churchill.

On Narcotism by the Inhalation of Vapors, Parts 8 to 18. By JOHN SNOW, M.D. London: Wilson and Ogilvy.

Essai Sur La Raison et La Folie.—Thèse Inaugural. Dewsbury: J. Ward, 1851, pp. 40.

The Journal of the Royal Agricultural Society of England, Vol. XII, part II., No. XXVIII. London: John Murray. (In Exchange.)

TO CORRESPONDENTS.

"M. A." We are much obliged by your suggestion and shall act on it. Will you favor us with your address so that we may, if necessary, communicate with you.

Errata in No. XXVII., p. 119, col. 2, line 4 from bottom, for action, read *active*.

Notice—[As we have heard of more than one instance in which books sent to us for review have not reached us, we shall feel much obliged if those who have sent us books, of which we have not acknowledged the receipt, will communicate with us on the subject.]

Other correspondents answered by Post.

NOTICE.—*All Communications, Books for Review and Substance for Notice must be addressed* "To the Editors of THE CHEMIST, care of Messrs. W. & T. Piper, Paternoster Row, London." *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following No. will in future be received as late as the 20th.*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

MEMOIR ON CAOUTCHOUC AND GUTTA PERCHA.

BY M. PAYEN.

For many years past caoutchouc, subjected to new processes, has formed the basis of many great industrial arts which furnish numerous common articles to domestic economy, and various utensils of indisputable utility in surgery, and in the mechanical, physical, and chemical arts, as well as in navigation.

The Great Exhibition of all Nations of 1851 presented numerous and remarkable examples of these applications, especially in the departments of England and the United States. It must be regretted that French industry of the same kind was not represented there, for the most recent progress in this direction has been effected amongst us.

Hitherto, however, although Faraday had pointed out the composition of the milky juice which contains the caoutchouc, and had published the elementary analysis of this product, we were not acquainted with all the properties of caoutchouc in the various states in which it is met with in commerce; its proximate composition had not been determined. The same notions were wanting as regards gutta percha, a substance newly introduced into manufactures, and still more remarkable from the properties which distinguish it from caoutchouc than from the curious analogies in which it resembles it—a substance worthy of interest, especially from its numerous and useful applications.

With the view of partly filling up these gaps, I have undertaken the researches of which I here give the principal results.

VARIETIES OF SOLID CAOUTCHOUC.

Among the commercial varieties are distinguished:

1. Opaque white caoutchouc in masses of various size.
2. That which is in leaves or irregular plates, yellowish and transparent.
3. Another kind, in thick leaves or globular masses, hollow or solid, of greyish brown tint and opaque.
4. Finally, under the same forms, brown caoutchouc, which is more or less translucid when cut into thin pieces.

INTERNAL STRUCTURE.

In examining under the microscope very thin layers of these samples, we observe very numerous irregularly rounded pores, communicating with each other, which dilated even under the capillary influence of liquids which had no solvent action on the substance itself.

ACTION OF WATER.

The porosity of the caoutchouc explains its easy penetrability by various liquids which have no great chemical action on it. Water presents one of the most interesting examples of this phenomenon; thin slices of dry caoutchouc, of the first two qualities, immersed for thirty days in water, absorbed in 100 parts, the first 18·7, and the second 26·4; the first had increased in length 5 and in volume 15·75 per cent.

A similar penetration of liquid may, in a long time, occur in the masses or thick

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leaves of caoutchouc, and it may be conceived that afterwards a considerable time is required for its complete elimination; for the superficial layers drying first, their pores become considerably contracted, and retard the further desiccation of the central portions.

Account should be taken of this kind of mechanical hydratation in commercial transactions, since, from this fact alone, the real value may be diminished from 18 to 26 per cent., whilst the whiter tint would indicate a purely illusory superior quality. Besides, the presence of water is opposed to the penetration of the liquids employed in the arts for dissolving or swelling the caoutchouc, and diminishes its tenacity and ductility.*

The apparent whiteness and the opacity have in general no other cause than the interposed water, for a complete desiccation restores the color and transparence.

ACTION OF ALCOHOL.

Anhydrous alcohol also easily penetrates caoutchouc, especially at the temperature of 172° F.; thin, dry, translucid layers, heated in this liquid several times during eight days, became opaque; their length was increased 46 thousandths, and their volume 94 thousandths; they had acquired considerable adhesive properties even in the alcohol Their weight had increased in the proportion of 100 to 118·6; however, they had yielded to that liquid 21 thousandths of a fusible fatty matter of fawn yellow color. These slices, after the evaporation of the alcohol, were more transparent and more adhesive to each other than prior to this treatment.

ACTION OF SOLVENTS.

Ether, benzine, essence of turpentine, sulphuret of carbon, and several mixtures with each other, or with other liquids, rapidly penetrate into the pores of caoutchouc, swell it up greatly, and seem to dissolve it; but that which, in this case is generally regarded as a complete solution, is in reality the result of an interposition of the part dissolved in the portion considerably swelled up, the latter having retained the primitive amplified forms, and being then very easy to disaggregate.

With the aid of a sufficient quantity of each solvent, we may completely separate these two parts, by renewing the liquid without agitating and without disaggregating the swelled up but undissolved residue.

The proportions easily dissolved vary from 0·3 to 0·7, according to the qualities of the samples and the nature of the solvent; but the properties of the two parts remain distinct after their separation and the evaporation of the liquid.

The undissolved substance is less adhesive, but more tenacious; it retains the greater part of the brown coloring matter. The soluble substance, especially the first dissolved, is considerably more adhesive, softer, less elastic, less tenacious, and less colored.

Anhydrous ether extracts from amber-colored translucid caoutchouc, 66 per cent. of white soluble substance, and leaves 34 parts of a fawn color.

Anhydrous and well-rectified essence of turpentine separated clearly from the common variety of brown caoutchouc, 49 of soluble matter, of an amber color, and 51 of translucid insoluble matter retaining the brown color.

Traces of resinous matter in the essence are sufficient for rendering the two products adhesive, and for leaving for a long time viscid that which has been dissolved.*

The essence in vapor directed on to caoutchouc removes from it an essential oil, which may be separated from the condensed product by heating the latter in a retort in a boiling water bath.

This essential oil is colorless, and possesses a powerful odor of caoutchouc.

INCREASE OF VOLUME.

If we keep caoutchouc, cut in the form of rectangular prisms, immersed in a great excess of solvent, it is seen to swell gradually from the superficies to the centre, and the increase of bulk of the undissolved

* It has long been known that the ductility and elasticity of caoutchouc increase with the temperature, diminish when the temperature is lowered, and are almost annihilated at 32° F.; that threads or bands stretched at 59 to 77° F., and cooled to 32° F., retain their extension and their stiffness at the ordinary temperature; that they contract suddenly, and resume their original elasticity when heated to 95 and 104° F. The useful applications made of these properties by M. M. Rattier and Guibal, for the preparation of elastic tissues, will be recollected.

* It was by purifying essence of turpentine from all resinous matter by distillation in a rectifying apparatus with multople cases that M. Fritz-Solier was enabled to obtain the plastic stuccoes and the large leaves which characterise his manufacture, which is perfected besides by several remarkable inventions.

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part, when the swelling has attained its maximum; the dimensions of the sides are tripled in benzine, in anhydrous ether, in essence of turpentine, as well as in a mixture of sulphuret of carbon, 100 with 4 of hydrated ether. The total volume, therefore, was equal to 27 times the original volume, although this increase referred to the undissolved portion, the other portion being disseminated in the liquid.

A mixture of 6 volumes of anhydrous ether with 1 volume of anhydrous alcohol swells caoutchouc to nearly quadruple its volume, and evidently dissolves only the less aggregated, less tenacious, but very adhesive portion.

An increase of 30 times its bulk was observed in rectified oil of petroleum, but without taking account of the portion dissolved.

The portion of caoutchouc which offers most resistance to solvents, observed under the microscope of the magnifying power of 300 diameters, presents a reticulated texture whose anastomosed filaments spread and swell up, absorbing the above-mentioned liquids, and contract in proportion as evaporation takes places.

The solutions of caoutchouc, especially the last-named, placed in the microscope, assume, in drying, this curious texture, which is rendered more evident in this case by hydrating the residue.

The best solvent of caoutchouc, of those which I have tried, is a mixture of 6 to 8 parts of anhydrous alcohol with 100 parts of sulphuret of carbon; indeed, if this proportion of alcohol be added to sulphuret of carbon containing sufficient caoutchouc to keep it for several days in the state of a slightly consistent turbid or opalescent jelly, liquifaction and clarification immediately occur. These changes depend on the solution of the fatty matter by the alcohol, and on the greater division of all the parts; however, the first portions dissolved are more fluid, and the last gradually more viscid.

If to this viscid liquid be added twice its bulk of anhydrous alcohol, all the caoutchouc is precipitated, the solution contains the greater part of the sulphuret of carbon, alcohol, and the fatty and coloring matters. It is understood that this consistent and tenacious pricipitate, fully impregnated with alcohol and sulphuret of carbon, is easily re-dissolved by an addition of the latter liquid, and gives a more complete solution, and that by repeating the same treatment several times, we are enabled to purify caoutchouc, and to render its solution more transparent.

In the ingenious manufacture of caoutchouc into cylindrical threads, established by M. Gérard of Grenelle, a paste is prepared by employing sulphuret of carbon mixed with 5 per cent. of ordinary alcohol. The latter contains 15 per cent. of water which is opposed to solution; thus are brought into play the favourable conditions of a swelling up of the caoutchouc, which aid in malaxating it, and facilitates its passing through the drawing apparatus without effecting actual solution, which would greatly diminish the tenacity of the product.

We owe to M. Gérard a new observation, which he has turned to account, for obtaining extremely thin threads. Having submitted to the temperature of 212° F. threads stretched so as to sextuple their length, this extension became permanent, and the threads were capable of undergoing a second similar extension. By sextupling the extension acquired five times following, it is evident that the primitive length must be increased in proportion of 1 to 16,625, and that the diameter being diminished in the proportion of this enormous elongation, the threads have attained a degree of fineness hitherto unknown. The new property discovered by M. Gérard must take its place here, and it will henceforward be reckoned amongst the most curious properties of caoutchouc,

The above facts seem to me to warrant us in regarding caoutchouc as one of the substances presenting in its different parts qualities intermediate between those of soluble and insoluble matters, or near the limits of solubility.

Differing greatly in its physical properties from the proximate principles whose rapid and complete solubility do not admit of these curious changes of form which certain plastic materials of the vegetable organism present, such as cellulose and amylaceous substances on one hand, and caoutchouc and gutta percha on the other.

The foregoing results demonstrate, moreover, that the caoutchouc sold in commerce constantly contains but in variable proportions:—

1. Easily soluble, ductile, and adhesive caoutchouc.
2. The proximate principle, tenacious, elastic, dilatable, and sparingly soluble.
3. Fatty matters.*

* According to the consideration that gluten owes its elasticity to interposed water, that if this liquid were not capable of evaporating, gluten would possess a permanent elasticity like caoutchouc, M. Chevreul in 1815 expressed the idea that

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4. An essential oil.
5. A coloring substance.
6. Nitrogenous matters.†
7. Water in proportions which may amount to 26 per cent.

When these various proximate principles are separated, none of them retains the elastic and extensible properties in the same degree as the whole. This appears to be owing to the adherence between the filaments which the fatty matter lubricates, and which the soluble and soft portion renders more soluble.

The samples which I present to the Academy show directly some of the new characters indicated in this memoir. The differences will be perceived which I have pointed out between the aspect, color, and tenacity of the soluble and insoluble portions; between anhydrous caoutchouc and that which is hydrated; there will easily be distinguished caoutchouc swelled to 27 times its original bulk, retaining, in the midst of an excess of solvent, the plain and angular form of strips cut.

I have added specimens of gutta percha more easily separated by the same processes into two distinct parts; one insoluble and retaining coloring matters, the other colorless, even when it is extracted from the brown matters and products of commerce; tenacious, moreover, and ductile—possessing, in a word, the useful properties of the first matter.‡

This analogy in the analysis and proximate composition will appear very worthy of interest if we compare the analogy of elementary composition, which coincides, moreover, with the various decided characters and the numerous distinct applications of these two singular substances.

In the second part of this memoir, I shall point out the proximate composition of crude gutta percha, and shall describe some phenomena of the sulphuration of caoutchouc by various agents, and the properties of the sulphuretted produce. The last part will contain the analysis, the distinctive characters, and the principal applications of caoutchouc and gutta percha.—*Comptes Rendus*, No. 1, 5th Jan., 1852.

"caoutchouc might be formed of a peculiar solid substance, and of an oily liquid substance."—*Elèments de Botanique, de Mirbel*, 1815.

† One of these matters is removed, with the fatty substances, by anhydrous alcohol; the dried residue is separated by means of water which dissolves it, and it is purified by re-dissolving in alcohol, which is afterwards evaporated.

‡ The sulphuret of carbon, and, better still, this liquid mixed with 6 or 8 per cent. of anhydrous alcohol, thus fractioning the gutta percha, and dissolving the greater part of it (from 0·85 to 0·90). Neither naphtha, alcohol, benzine, ether, nor essence of turpentine appear to dissolve it cold, but remove from it its other proximate principle. Water penetrates it slowly, and may increase its weight 3 per cent.

MEMOIR ON THE ESTIMATION OF BROMINE.

BY M. LOUIS FIGUIER.

Concluded from page 197.

THE examples which I have just quoted are sufficient for showing how the process of analysis which I propose may serve for determining in mineral waters, in what state the bromine is contained in them; the bromides of sodium and magnesium are, indeed, the only compounds of bromine which have hitherto been found in natural waters.

It remains for me to anticipate some difficulties which might occur in the practical execution of this process of analysis, and to point out the means of overcoming them.

The employment of chlorine for the estimation of bromine might give rise to serious errors in acting on mineral waters containing a salt of iron or manganese. Iron and manganese being found in these waters in the state of salt of protoxide, the chlorine would be absorbed by these oxides, which would pass to the state of peroxides, and would thus introduce a serious cause of error into the result of the analysis. It is therefore necessary, before proceeding to the determination of the bromine, to carefully separate the oxide of iron or manganese. As the oxide of iron is precipitated by simply boiling the water, it is sufficient, in order to avoid this cause of error, to evaporate the water nearly to dryness. In this manner, the separation of the oxide of iron is effected, and it can then exert no influence on the result of the operation.

It is frequently necessary to estimate bromine in the mother liquors of saline springs. In Germany, this kind of product has been turned to great account in therapeutics, and these saline residues are used for mixing with the mineral-water baths, in order to increase their activity. The analysis of these mother liquors will even be one of the cases in which the process of analysis which I propose will be most frequently and advantageously applied. Now, it sometimes happens, when these mother

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liquors have been for a long time exposed to the air, that they acquire a very deep yellow color. This circumstance is very detrimental to the process which I describe, for the yellow color of the liquid is confounded with the color of the bromine, and besides, this coloration is sometimes due to organic matters which may take up a little of the chlorine, and disguise the latter, to the detriment of the analysis. It is, therefore, important to destroy this coloration. Animal charcoal did not answer well for attaining this object, and, besides, it was to be feared that it would retain some of the saline substances. One means which answers very well for effecting the complete decoloration of the liquors, consists in pouring in a few drops of bromine, and afterwards boiling, to drive off the excess of bromine. I ascertained by experiment that, provided that the liquid was kept acid, it retained no trace of bromine, and that, in this case, this body might be made to intervene without any fear of error in the analysis.

The presence of a considerable quantity of organic matter in the mineral waters might cause complication in the employment of this new mode of analysis. It would be sufficient in a case of this kind, to evaporate to dryness and to heat the residue rather strongly heated in a capsule, to effect the decomposition of the organic matter. We may say, however, that organic matters are seldom found in considerable proportion except in sulphurous waters; and, hitherto, the presence of bromides has not been detected in this kind of mineral water.

The process of analysis for the bromides, by means of the solution of chlorine of known strength, would present, finally, an evident difficulty in its application when the liquor to be examined contained iodides. It is clear, that in this case the chlorine would be employed in expelling the iodine, and that a serious error would be committed in carrying the quantity of chlorine to the account of the bromine. But it is sufficient, for guarding against this cause of error, to begin by separating the iodine from the solution. The chloride of palladium is the most suitable reagent for this purpose. Only, care must be taken afterwards to separate the excess of the chloride of palladium remaining in the liquor by means of sulphuretted hydrogen; the metal is precipitated in the state of sulphuret. The liquor is afterwards boiled for some time, in order completely to drive off the last traces of sulphuretted hydrogen. If, indeed, this latter compound continued in the liquid, it would afterwards react on the chlorine, and would thus introduce into the analysis a cause of error.

However, the importance of the inconvenience in question must not be too much exaggerated. The presence of iodine, united at once to bromine and chlorine is, at least as regards mineral waters, a very rare circumstance. Although the general opinion is far from agreeing with this assertion, I can prove that the simultaneous presence of these three bodies is only very rarely observed. In the numerous analyses of bromuretted waters made by MM. Mialhe and myself, in the course of our work on the waters of Germany, we never found iodine united to bromine, either in mineral waters, or in the mother liquors of the saline springs. I have several times had occasion to seek for the presence of iodine in sea water, and although the existence of iodine in sea plants sufficiently points out its presence in that water, I have never succeeded in proving it. Quite recently I have made this research by acting on the mother liquors of our salt works, and I have succeeded no better. The existence of iodine in the water of Balaruc had been announced; it was in vain that I sought to prove its existence in the residue of the concentration of 10 litres of this water, when it was analysed by M. Marcelle de Serres and myself in the work which we published on that occasion in 1847.

It is quite evident that in practice this process of analysis cannot be attended with any serious difficulty.

The employment of a solution of chlorine of known strength is not the only means which may be employed for determining, with accuracy, the quantity of bromine in the combinations or mixtures in which it is engaged. I have devised and used with success another method of analysis based on quite different principles, and which I think equally susceptible of great accuracy. Its execution is longer than that of the foregoing; I do not, however, think it useless to make it known to chemists, for it may with advantage be applied for checking the results furnished by the mode already described.

This second means consists essentially in the employment of chlorine and ether for removing the bromine, and in the conversion of the bromine thus isolated into bromide of sodium, which is then decomposed by chlorine. The difference between the weight of the chloride and bromide of sodium united, and the weight of the chloride which remains alone after the de-

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composition of the bromide by chlorine, indicates by means of calculation, the quantity of bromine sought for.

Serullas had proposed a process founded on analogous principles; but its execution was so defective that the results which it furnished could not in any way be depended on. I need only say that, according to Professor H. Rose,* in order to arrive at an approximation to truth it was necessary "to increase by one-third or one-fourth the quantity of chloride of silver found." The analogy of my process to that of Serullas does not extend beyond the first part of the operation.

The following is the second method of analysis. The concentrated mineral water, or the solution containing the bromide to be estimated, is placed in a stoppered glass flask: its own bulk of ether is added; the solution of chlorine is then added, and it is agitated. To ascertain if the quantity of chlorine added is sufficient, I introduce into the aqueous portion of the liquor a little solution of chlorine. This is easily done by means of a pipette with a long stem, the aspiration of which is effected by means of a caoutchouc bulb. If the quantity of chlorine added is sufficient, it is perceived by the liquor turning yellow, owing to the liberation of bromine at the part which is in contact with the chlorine. The best mode of ascertaining whether the decomposition is complete is to remove a little of this aqueous solution with the pipette, and to try the action of chlorine on it. When a drop of chlorine added immediately renders the liquid quite colorless, it is a sign that all the bromide is decomposed. With the pipette with a caoutchouc bulb, these little manœuvres, which do not require much skill, are easily and very conveniently executed.†

When the solution of bromide is entirely decomposed by chlorine, the ethereal liquor containing the bromine, and which floats on the aqueous liquid, is removed with the pipette. A little fresh ether is then added, which dissolves the last traces of bromine and completely clears the liquor, which, previously had a yellowish tint, resulting from the bromine dissolved in water. This new ethereal liquor, of a much paler color, is likewise removed with the aid of the pipette, and by thus acting with care, we may separate all the bromine, removing only a very minute quantity of the saline liquor operated on.

The bromuretted ether, which is thus successively removed, is poured as it is taken into a bottle into which has previously been placed a little solution of alcoholised soda. The ethereal solution, in contact with the alkaline liquor, is rapidly decolored and is converted into bromate and bromide. The ether floats entirely decolored.

This alkaline solution, on which the ether floats, is then poured into a porcelain capsule, and placed on a cold sand-bath, which is gradually heated, so as to volatilise the ether. When the ether has disappeared, a very small quantity of matter of resinous appearance, which arises from the action of the potassa on the ether, is seen to separate; this matter is separated by filtration. The liquor is then very accurately saturated by hydrochloric acid, so as to convert the soda into chloride of sodium. It is then evaporated to dryness, which furnishes a mixture of chloride and bromide of sodium combined with a little bromate of soda.

To decompose this bromate of soda and a little chlorate of soda which may also exist in the mixture, it is calcined in a covered platinum crucible, at a dull red heat, so as to render it rather pasty, but without fusing it, for a little chloride and bromide would thus be volatilised. During this calcination the salt is slightly blackened. This mixture, thus calcined, is then weighed with care, and afterwards dissolved in distilled water. The slight residue of charcoal which is formed is collected on a filter and weighed when its weight is appreciable. This weight is subtracted from that of the mixture calcined.

It then only remains to convert the bromide existing in the liquor into chloride, in order to appreciate, by the difference of weight which this decomposition causes, the quantity of bromine sought for. For that purpose, the saline mixture is dissolved in distilled water, placed in a glass flask, acidulated with a little hydrochloric acid, and treated with an aqueous solution of chlorine; the liquor immediately turns yellow by the formation of free bromine. It is boiled in order to drive off the bromine. A little chlorine is again added. If the liquid again assumes a yellow color, it is boiled again to drive off all the bromine, and we are thus enabled to liberate all the bromine and to replace it by chlorine.

* *Traité pratique d'analyse Chimique*, 1re edit. p. 477.

† I used, for analyses of this kind, a stoppered flask of the capacity of half a pint, and fitted at its lower end with a small glass stop-cock. This little apparatus is very convenient for operations of this kind: but as it does not exist in all laboratories, I have described the operation, as it may be performed in an ordinary flask.

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This solution is then evaporated to dryness, the residue is calcined in a covered porcelain capsule, at a full red heat. The residue of this calcination is weighed. The difference between the two weights gives the weight of the bromine by calculation. Indeed, the quantity of bromine sought is to the difference of the two weights, as the atomic weight of bromine is to the difference of the atomic weights of bromine and chlorine. By multiplying this difference by the cypher 1·7947, that is to say, by the equivalent of bromine divided by the difference of the equivalents of bromine and chlorine, we arrive at a number which expresses the quantity of bromine existing in the mixture.

To make this process more intelligible, I will give the details of one of these analyses, with the numbers which it furnished.

I weighed 60 grammes of sea salt, purified by three crystallisations, and perfectly free from bromide and iodide: I dissolved it in water, and I added to this liquor 1·68 gr. of bromide of potassium, containing, according to calculation, 55 centigrammes of bromine. This solution, introduced into the glass flask, was treated by chlorine and ether: the bromuretted ether was put in contact with a solution of pure potassa; the potassa being saturated with hydrochloric acid and the liquid evaporated, the residue was calcined in a platinum crucible. After this calcination, the mixture of chloride and bromide of potassium weighed 3·79 gr. It was dissolved in water and treated with liquid chlorine; the solution was evaporated, and the residue slightly calcined. This calcined residue weighed 3·49 gr. The difference between these two weights is, therefore, about 3 decigrammes; by calculating as we have just said, we find as a result 1·635 gr. of bromide of potassium, containing 538 milligrammes of bromine. The error of 1 centigramme, which we find as the result of this analysis, will appear very slight if we compare it with the uncertainty which had hitherto prevailed in the results of analyses performed with the processes formerly known.

This second method for the analysis of the bromides will be particularly useful as a means of controling the process previously described.

I only proposed, in this work, to pass in review the processes which may be used for the estimation of bromine. However, when we know the close analogy which bromine and iodine present to each other, it is easy to foresee that the process of analysing the bromides, by means of a solution of known strength, might also find its application for the estimation of iodine. It is sufficient, indeed, to take a solution of bromine and to determine its strength with a known quantity of a soluble iodide; this solution may be used for appreciating the richness of a saline mixture in iodide.

I am not ignorant that this mode of estimation loses much of its importance when applied to iodine, for this metalloid gives rise to insoluble compounds with substances which do not form a precipitate with chlorine and bromine; we also find in the sulphate of copper and chloride of palladium certain means of accurately separating these bodies. But there are cases in which it may be desirable to be freed from the slowness of the analysis by weighings, and, in this case the use of a solution of bromine of known strength presents many advantages. Indeed, the daily increasing employment of iodide of potassium in medicine, and its high price, have led in commerce to the admixture with it of several salts of less value, such as sulphates, chlorides and bromides. It is therefore very important for pharmaceutists to be able to detect the existence of these frauds; and, to avoid the slowness of chemical analysis, several means of determining the purity of the iodide of potassium of commerce have been proposed In 1846, M. Berthet proposed to detect the slightest trace of iodide of potassium, by turning to account the reaction which an alkaline iodate exerts, under the influence of sulphuric acid, on iodide of potassium. In this case, there is a decomposition of the two salts, and precipitation of all the iodine contained in one of them. We have, indeed,

$$IO^5, NaO + 5IK + 6SO^3 = SO^3, NaO + 5SO^3, KO + 6I.$$

M. Berthet forms, with iodate of soda, to which a small quantity of sulphuric acid is added, a normal liquor which he places in a graduated burette, and he appreciates the richness of the iodide by decomposing this salt by means of this normal liquor. He boils the liquid to drive off the iodine, and thus ascertains the precise moment when the iodine has entirely disappeared.

This process is accurate in its application, but it is easy to see that the employment of a solution of bromine of known strength, for obtaining the same effect, is in all respects far superior to it. Indeed, the iodate of soda is a salt whose preparation is very delicate; it is difficult to free it from iodate, and in this respect the solution of bromine in water is a reagent much more easily obtained. Besides, the iodate of soda itself gives, during the reaction which is set

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up, a deposit of iodine, which unites with the iodine furnished by the iodide analysed. It is evidently a very irregular mode of experimentation to introduce, in the practical search for a body, the very same body which has to be estimated : thus, in performing this operation, we are surprised at the considerable quantity of iodine which is deposited. This body is precipitated in liquors under the form of a black powder, and it requires a very long time for boiling to cause it to entirely disappear. The process employed by M. Berthet for the analysis of the iodide of potassium of commerce cannot, therefore, I think, bear a comparison with that of which I have spoken.

As regards the means of execution, they are exactly similar to those which I have explained in speaking of the analysis of the bromides. The solution of bromine is prepared by taking an aqueous solution of bromine, which is obtained by leaving distilled water for 24 hours in contact with an excess of bromine ; this solution is diluted with twelve times its bulk of water, and a liquor of a very pale yellow color is thus obtained. The strength of this solution is tested with pure iodide of potassium. To obtain this latter salt in this state, iodate of potassa must be prepared by the action of iodine on pure potassa, and the salt afterwards calcined in a platinum crucible.

The decomposition of the iodides by bromine presents moreover the same phenomena as the decomposition of the bromides by chlorine. When we pour the solution of bromine of known strength into the solution of an iodide, the liquor acquires a very deep brown yellow color, and when the liquor is heated, the iodine is disengaged in the form of violet vapors; the liquor very soon becomes clear, and remains perfectly colorless. It is, perhaps, rather difficult to seize the precise point at which the decomposition is complete, when we act with bromine, as, when we act with chlorine, the slight yellowish color of the solution of bromine renders this point delicate to appreciate; but, with a little practice, this difficulty is easily overcome, and the process presents quite as much accuracy when it is required to estimate an iodide by bromine, as when the bromides are estimated by chlorine.—*Annales de Chimie et de Physique*, Nov. 1851.

NEW TEST FOR MERCURY.

BY MR. A. MORGAN.

If a strong solution of iodide of potassium be added to a minute portion of any of the salts of mercury, placed on a clean bright plate of copper, the mercury is immediately deposited in the metallic state, appearing as a silvery stain on the copper, which cannot be mistaken, as no other metal is deposited by the same means.

By this method corrosive sublimate may be detected in a drop of solution unaffected either by caustic potash or iodide of potassium. In a mixture of calomel and sugar in the proportion of one grain to two hundred, a distinct metallic stain will be obtained with one grain, which of course contains 1-200th of a grain of calomel ; in like manner, 1-400th of a grain of peroxide of mercury may be detected, although the mixture with sugar is not in the least colored by it.

With the preparations of mercury in the undiluted state, this process acts with remarkable accuracy, the smallest possible quantity of calomel or peroxide of mercury, such as would almost require a magnifying lens to perceive, placed on copper and treated with iodide of potassium, will give a distinct metallic stain.

The advantages of this test may be briefly stated as follows :—1st, It is a delicate test, inferior only to chloride of zinc and the galvanic test of zinc and gold. 2nd, It is easy of application. 3rd, It requires a very small portion of the substance to be examined—a matter of no small import. 4th, Acting on the insoluble as well as the soluble salts, it obviates the intermediate process of solution. 5th, When it acts, its indications are decisive.

As to its disadvantages, the only one which seems tenable is, that although it acts on minute portions, still that must be in a concentrated condition. For instance, though we may detect the 1-100th of a grain of corrosive sublimate in a drop of water, we cannot detect it in a drachm; but this may of course be remedied by evaporation.

Now, with regard to the theory of this process, the following seems most satisfactory, that the iodide of potassium forms a soluble and easily decomposed salt with the various salts of mercury; that is, an iodide soluble in excess of the iodide of potassium.

The foregoing is the substance of a paper read by Mr. Arthur Morgan, City of Dublin Hospital, at the first meeting of the Students' Medico-Chirurgical Society, on Friday, December the 12th, 1851.—*Dublin Medical Press.*

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ON THE COMBINATIONS OF SESQUIOXIDE OF URANIUM WITH THE ACIDS.

BY M. AIMÉ GIRARD.

It is known that the sulphtie of uranium gives in water charged with sulphurous acid a green solution which, in contact with the air, becomes yellow by conversion of the protoxide of uranium into sesquioxide. I repeated in the laboratory of M. Pelouze the beautiful experiments of MM. Peligot, Ebelmen and Ramelsberg on the salts of uranium, I have arrived at this fact, and have sought to discover whether, in this action, the oxidation refers at once to the acid or the base, or, in other terms, if sulphurous acid is able to reduce sesquioxide of uranium or to combine with it.

Sulphurous acid combines easily with the sesquioxide of uranium to form with it a compound of very great stability.

When a current of well washed sulphurous acid is passed into water holding in suspension hydrated oxide of uranium, prepared according to M. Mitscherlich's method, (U^2O^3HO), the oxide is dissolved, and the liquor acquires a yellow color. When this liquor is left to spontaneous evaporation, it deposits a salt crystallised in small, yellow, prismatic needles. This salt, heated in a tube, disengages water and sulphurous acid, and leaves a residue of oxide of uranium.

To analyse this salt, I acted on it with nitric acid, until no more vapors were evolved; the sulphurous acid was thus oxidised; I diluted it with water, and precipitated it with nitrate of baryta; the sulphate of baryta gave me the weight of the sulphur, and, consequently, of the sulphurous acid. I afterwards precipitated the filtered liquid by means of ammonia, and decomposed the uranate by calcination. Four analyses gave me as an average the following numbers per cent.

Oxide of uranium	67·4
Sulphurous acid	16·6
Water.....	15·7

These numbers correspond to the formula $U^2O^3SO^2+4HO$, which requires

Oxide of uranium.....	67·8
Sulphurous acid.....	16·9
Water.....	15·3
	100·0

The sulphite is soluble in sulphurous acid in either alcoholic or aqueous solution. It is precipitated from its aqueous solution by boiling. It is stable at the ordinary temperature, but is decomposed, disengaging sulphurous acid, when heated.

When a current of sulphurous acid is passed into water holding in suspension uranate of ammonia, it is dissolved, and the liquor deposits a mixture of two yellow salts: one is the neutral sulphite, and the other the granular sub-sulphite, obtained by M. Berthier, by boiling a salt of uranium with sulphite of ammonia. Liquid sulphurous acid, poured on hydrated oxide of uranium, does not dissolve it and exerts no action on it.

The composition of this salt (1 equivalent of acid and 1 of base) seems to me to establish once more that the sesquioxide of uranium, as M. Peligot demonstrated, is converted into protoxide. I have thought that it would be interesting in this point of view to prepare the pyrophosphate of uranium, pyrophosphoric acid always taking 2 equivalents of base to 1 of acid, when the base is a protoxide. The salt which I thus obtained, $PhO^5, 2(U^2O^3)$, has exactly the composition which might be expected according to the theory of M. Peligot.

When a solution of pyrophosphate of soda is poured into a solution of nitrate of uranium, a bulky yellow precipitate of pyrophosphate of uranium is formed, which becomes a crystalline mass, especially when hot liquors have been used, and is redissolved in an excess of precipitant.

To analyse this salt, I took a certain weight of it dried in a stove at 212° F., and I dissolved it in nitric acid and boiled it with a known weight of tin, according to the process described by Senor Alvaro Reynoso: all the phosphoric acid remained in the state of insoluble phosphate of tin, which gave me the weight of the phosphoric acid. I afterwards precipitated the filtered liquor by ammonia, and calcined the precipitate.

Four analyses gave me as a mean the following numbers per cent.:—

Oxide of uranium	79·9
Phosphoric acid	19·6

which correspond, for the dried salt, with the formula:—

$$PhO^5(U^2O^3)^2.$$

which requires

Oxide of uranium	80
Phosphoric acid 20	

When this salt is dried in a stove, it loses 11 per cent., which corresponds with 5 equivalents. Its true formula is therefore:

$$PhO^5, 2U^2O^3+5HO.$$

This salt is equally insoluble in water, alcohol and ether. It is soluble in nitric acid; the alkalis precipitate it from this solution. When it is precipitated rapidly, it is of a fine yellow, and appears under the microscope under the form of small granular

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crystals; in the air it effloresces and becomes of a pale yellow.

Its solubility in an excess of precipitant distinguishes it from the ordinary phosphate. This reaction may even be employed for distinguishing a phosphate from a pyrophosphate. On pouring into the solution a drop of a very dilute solution of nitrate of uranium, a yellow precipitate will be formed which, in the case of the pyrophosphate, will be redissolved, whilst the ordinary phosphate will not be dissolved.—*Comptes Rendus*, No. 1, January 5, 1852.

REPORT ON THE "TISSU CELLULAIRE ARTIFICIEL" OF MELSENS.

BY ROBERT D. LYONS, M.B. T.C.D., M.R.I.A., ETC.

THE results of chemical investigation have made us familiar with the elementary composition of almost all the organised products which constitute the structure of animals and plants, and even in those instances in which our knowledge in this department has not yet reached the limits of scientific accuracy and precision, we may confidently anticipate that the labors of the numerous inquirers who are now actively engaged in prosecuting researches in organic chemistry will, at no very distant period, fill many of the more important *lacunæ* which may still be pointed out. On the other hand, histological inquiry has revealed to us the intimate structure and minute organisation of every tissue, and with the aid of the microscope, we can now, with perfect facility, study the ultimate form of every constituent element of the vegetable or animal, which possesses distinct morphic properties. What is still to be desired on this side of the general inquiry into the nature of organic bodies may be hopefully looked forward to; its accomplishment will, no doubt, before long reward the industry of the present generation of zealous and intelligent micrologists. But while chemistry thus informs us of the composition of organic bodies and their structure is revealed to us by the microscope, we have yet much to learn with regard to the particular operations by which definite forms are assumed by the elementary tissues. Here, indeed, exists a broad and deep *lacuna*, which separates the results of the chemist and the micrologist. It is true, that bold speculations have attempted to bridge this chasm; yet, notwithstanding what we owe to the splendid generalisations of Schleiden and Schwan, no portion of organic science is more incomplete, or presents so many undetermined problems.

Many considerations concur to establish the probability of the proposition, that the fluid state is necessarily the first in which the elements of a tissue must exist previously to their undergoing a morphic determination, precipitation, histomorphosis, or whatever other analogous term may be assumed to denominate the simplest change which may be supposed to occur in the passage of a perfectly amorphous fluid into a tissue of definite shape. The chemical properties of the fluid are familiar to us; so likewise are the forms which it assumes as a distinct tissue; but what those laws are, in obedience to which the latter condition results from the former, constitute, I think, one of the most obscure, and at the same time intensely interesting questions which can be found in the whole domain of organic science. What are the forces brought into play to determine not only the formation of a tissue in an amorphous fluid, but also to give it peculiar and characteristic properties? These are questions which spring up at every moment when we venture to contemplate the very interesting but mysterious phenomenon of *histogenesis*, a general term which may be used to designate the subject under consideration.

Under the head of histogenesis many of the most obscure and difficult problems are included. Thus, for instance, we may inquire: what it is that determines the transudation of a blastema? what the particular nature of this fluid, which cannot, in all probability, be identical in any two normal tissues, not to speak of those of pathological origin. And this latter question, it may be remarked in passing, bears a very great analogy to that which demands a solution of the obscure physiological problem, why the liver secretes bile, the kidney urine, &c., &c.

While science has still to deplore the extremely imperfect and unsatisfactory condition of this portion of its domain, we are yet not altogether without indications as to the direction in which research may be prosecuted. And in more than one instance it is consoling to know that an *empirical law* has been ascertained, which, as is familiar to observers, is only second in value to the true scientific law, whose discovery it has so often preceded in other branches of science. Thus we owe to Ascherson a knowledge of the interesting fact that the contact of two homogeneous fluids, oil and albumen, results invariably in the immediate production of morphine elements. And more recently still, the observations and

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experiments of M. Melsens have established the possibility of one of these fluids undergoing distinct and very remarkable histomorphosis. The experiments of this observer must be looked upon rather as a highly interesting exegetical study,—furnishing a valuable amount of inferential and collateral evidence, capable, to a certain extent, of application to the explanation of the changes which occur within the system, —than as a direct contribution to our knowledge of these operations.

On former occasions the readers of this Journal have been furnished with the views of the most distinguished modern physiological pathologists, as to the relative importance of the part played by albumen and fibrine in the formation of tissues. The former has so much interest in its relation to histogenesis that everything concerning its chemical history cannot but be received with consideration, and I shall make no apology for introducing some lengthened extracts from M. Melsen's valuable and highly original memoir. As will be seen, the results of this inquirer bear more especially on the action of purely physical causes on albumen, in combination with various salts by which it is not precipitated.

"We know" says M. Melsens, "that many feeble acids do not precipitate albumen from its solution: my experiments have reference especially to the trihydrated phosphoric and acetic acids; this ceases to be the case when albumen is present with those salts which have no apparent chemical action on it, the reactions change, for acetic acid, as well as the phosphoric, with their equivalents of base, and some acid phosphates as well, precipitate it more or less completely. I know of only a single case in which albumen is precipitable by acetic acid, namely, when it is acidified by sulphuric acid in the soluble compound designated by Berzelius, sulphate of albumen. As for the action of acetic acid on pure albumen, obtained by the process of M. Wurtz, it is entirely different, as we shall see further on.

"The following is the process by which I prepare the salified solution of albumen:—The white of an egg is mixed with its volume of water, and filtered; this constitutes the *normal solution of albumen*, with a specific gravity of about 1020. The filtered liquid is saturated with salts, which are added in excess, after which the fluid is filtered again, to separate the excess of salts; the fluid resulting from this second filtration may be denominated the *normal saturated albumen*. The normal albumen saturated with chloride of sodium has a specific gravity of about 1200.

"My experiments have been made with almost all the salts which are without an apparent action on albumen, as well as with those which begin to precipitate it, but whose precipitations are soluble either in an excess of albumen or of the salt; for some salts of baryta, of lime, of magnesia, and of ammonia, &c., the albumen must be left in excess, for in saturating it with these salts it is precipitated, if they are added in excess; when we wish to examine the reactions in this case, it is necessary to add, little by little, the solution of normal albumen, until we obtain the resolution of the precipitate first formed. I will not pronounce on the nature of the precipitates obtained; but it will appear evident that we must, in the generality of cases, admit that the albumen is precipitated in consequence of a particular physical disposition of the liquid; that if at times the precipitation does not occur immediately, in dilute liquor for example, agitation may cause a troubled condition of the fluid, as occurs in precipitation, crystallisation, solidification of water, of sulphate of soda, of phosphorus, &c. * * * Tribasic phosphoric acid precipitates normal albumen saturated with salts; certain salts, amongst which are borax, phosphate of soda, acetate of soda, acetate of potassa, form an exception to this rule; however, if the fluid be agitated with a glass rod, a troubled condition is slowly produced by the mechanical action. The solutions of albumen with other salts are all precipitated by phosphoric acid; these precipitates are soluble in an excess of the acid. The presence of the salts, therefore, permits us to make with albumen and the trihydrated phosphoric acid an experiment which requires, with normal albumen, the monohydrated phosphoric acid which precipitates it, and the trihydrated, which dissolves the precipitate formed."

These examples will be sufficient to show the nature of the results which have been arrived at by M. Melsens; similar experiments were made with a variety of other substances, such as corrosive sublimate, ether, alcohol, creosote, &c., but it is unnecessary to follow out their details. I shall, therefore, pass to the consideration of a series of experiments which to many will appear still more conclusive, as to the action of physical causes on albumen.

"If," says M. Melsens, "after the experiments which precede, I am induced to believe that the particular physical constitution of the liquids plays some part in the precipitation of albumen, those which follow cannot leave the least doubt as to the action of agitation.

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"Some very dilute liquids remain limpid until beaten with a glass rod, when they become troubled, and immediately parcels of fibres may be seen to form under the influence of agitation; under the microscope these appear, as very distinctly organised fibrous forms, which, by juxta-position and felting together, constitute actual membranes. We have thus a phenomenon conformable to the production of mineral precipitates by the influence of agitation."

I shall only briefly notice some of the remaining experiments. A current of air was passed through a solution of normal salified albumen, sufficiently dilute not to allow of the froth passing out of the vessel. This froth was seen to be transformed into a solid body, insoluble in ammonia, potassa, water, or dilute acids. To obviate two objections which might be started to this experiment, air saturated with the vapor of water, and hydrogen purified by caustic potassa and saturated with vapor, were successively employed. Lastly, to avoid all sources of error, a solution of albumen diluted with water was agitated *in vacuo*, by converting the vessel into a sort of water hammer, after expelling the air by heat and an air pump, the orifice being subsequently hermetically sealed. The solution, perfectly limpid at first, became troubled after a few shakes, and a membrane was rapidly formed.

The solid body thus formed from a limpid solution of albumen by the simple effect of agitation, was subjected to microscopic examination by M. Gluge, from whose report I shall make a few extracts:

"The albumen of the white of egg, solidified by mechanical actions, resembles false membranes, and even serous. It is presented to our view under the form of membranes covered with granulations of from $\frac{1}{2}$ to 1 millimetre in diameter, white, semi-transparent, about $\frac{1}{4}$ or $\frac{1}{2}$ millimetre thick, and sufficiently elastic. With a magnifying power of 300 we can distinguish an amorphous substance finely punctated, in which are found fibres, sometimes isolated, sometimes united in bundles, like the fibres of cellular tissue, more often easily isolated and elastic. Their diameter varies from $\frac{1}{600}$ to $\frac{1}{400}$ of a millimetre: more rarely there may be seen large and transparent fibres, analogous to those which are met with in fibrine. In the middle of these fibrous bundles may be observed granulations composed of little globules of $\frac{1}{400}$ to $\frac{1}{800}$ of a millimetre in size, and enclosing some bubbles of air. These globules are sometimes very regularly grouped, and then form rounded masses. The fibrous aspect of the solidified albumen differs from that which albumen possesses when transformed into pellicles, thin, opaque, and much less elastic, such as are obtained by the process of Ascherson. These last present folds, and not fibres fully developed like the former: they appear rather to be formed of very small granules."

I have introduced these lengthened extracts from M. Melsen's memoir from a conviction of the great interest attaching to the subject, and from the light which his experiments throw on the very obscure subject of histogenesis, it is to be hoped that they will be further followed out.* The primary stages of the formation of the embryonal tissues require a very accurate investigation, and we possess as yet but little data to form an opinion as to their primary mode of origin. In his paper on the structure of the uterus, Kilian observes that the coagulable blastema of the embryonal tissues, especially of muscles, possesses the property of contracting, through attenuation and desiccation, while, at the same time, in the fluid portion of the preparation, delicate, round, or angular discs, like thin flakes of fibrine begin to appear. They sometimes enclose a nucleus, and though pale and delicate at first, like young cells, become subsequently like horny epithelial scales, being no longer soluble in acetic acid, which only renders them paler † It is much to be regretted that the records of physiological research during the past few years afford but very scanty materials for determining with certainty any of the laws which preside over the primary formations of tissue.

I had recently an opportunity of inspecting a very beautiful and large specimen of albumen, solidified by the process of agitation, in the possession of M. Melsens. To the naked eye it presented the appearance of a membrane of a whitish color, formed by the interlacement of parcels of fibres,

* In the last Number of a British contemporary Journal an exceedingly brief extract is made from the Memoir, to which a short editorial statement is appended. I doubt if the writer had seen the original, as it is almost impossible to understand how, if he had perused M. Melsen's account of his exceedingly careful experiments, he could be induced to make such remarks as to sources of error or deception arising from the presence of fragments of the albumen membranes, or the chalazæ. The double process of filtration employed completely prevents such an error.

† See Canstatt's Jahresbericht, Bd. i. p. 24. 1850.

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which enclosed spaces of an irregular shape; it was tolerably tough, dense, and resistent.

M. Melsens was so kind as to present me with a small portion of the preparation, which I submitted to a most careful microscopic examination on my return to Dublin, and I had thus the satisfaction of verifying, in the most complete manner, the results of M. Gluge's investigations. As my examination was conducted with powers higher than those employed by this eminent micrologist, and as consequently some of the more minute details were better shown, perhaps I may be allowed to append a brief statement of the appearances seen in my examinations. Though the specimen has been preserved now for several months in spirits of wine I do not find that it has thereby lost any of the characters detailed in M. Gluge's report.

A fragment of the solidified albumen, teased out with needles, placed on a glass slide, and covered with a thin slip in the usual way, was placed in the field of a very fine Ross in my possession; the glasses employed were the $\frac{1}{8}$-inch objective, and the eye-piece A, registered by Ross as giving, in combination, a magnifying power of 420 linear, which is, I think, certainly somewhat over the actual magnifying power; and indeed, I may observe, in passing, that repeated measurements with the stage and ocular micrometers (Robin's method) have satisfied me that the registered magnifying power of all glasses, both English and foreign, is considerably overstated by the makers, from the want of a perfectly true method of estimating the magnifying power, which is still a great desideratum in microcology.

The specimen examined with the glasses above named presented four distinct kinds of elements. Firstly, a granular base; secondly fibres which were flat, round, straight, curled, isolated, or interlaced in various ways; thirdly, spherical bodies of different sizes; and lastly, flat, scale-like particles, these being the least numerous constituents.

The granular base constituted a very considerable proportion of the entire specimen, but did not appear to be uniformly disposed throughout it, as in some portions it formed nearly the entire, while in others it was almost altogether replaced by fibres.

The solidifying force would thus appear not to have acted with uniformity. To determine what modifications of it produced granular matter,—what fibres,—what again caused the formation of the little spherical bodies,—are questions, perhaps of too delicate a nature to admit of ready solution. Could we arrive even at an approximate explanation, a great step would be achieved in the history of the obscure process of histogenesis.

The fibres constituted a very large element; the majority of them presented a very clear, decided, and *clean* outline. Many of them lay parallel to each other, and, as far as they could be traced, formed straight lines. Others, again, terminated in rapid curves; in one little parcel, which was very well shown, and which I had thus an opportunity of observing very attentively, they curled and interlaced with each other in a very graceful manner. In their general disposition, as well as in size and shape, they bear a very close resemblance to the fibres of the yellow elastic tissue, for which I make no doubt they would have been readily mistaken by any one casually looking at them through the microscope. Some masses of the fibres lay isolated; others were to be seen taking an origin in the granular base, where their commencement could not be well defined: others, again, lay in contact with the scale-like bodies, to be presently noticed. To me, however, the most interesting of all the structure observable in this preparation, are the spherical bodies. With the exception of the scales, they were the least numerous. I observed them in two situations, in most abundance on a square-shaped mass of the granular base, and in another portion in contact with fibres. The smallest bodies of a spherical shape, but not those to which I shall more particularly refer, were about the size of the well-known oleo-albuminous granules, and closely resembled them in their reflective properties. The *spherical bodies* were nearly uniform in size, grouped quite close to each other, and presented all neary similar characters. They showed a dark border, their interior varied with the amount of light transmitted, but under all conditions of light, both as to intensity and obliquity, they presented a sort of nucleus, which in all was of a long, elliptical shape, though the bodies themselves appeared as nearly as possible spherical. This nucleus was in length equal to about one-half the diameter of the sphere, and in breadth about one-eighth. What was the nature of these bodies? They were certainly not either spheres of oil or bubbles of air; there was not the slightest probability of the former substance being present; air bubbles they also could not be; the specimen had been at rest in spirit for a very considerable time, while, as more positive evidence of their nature, I would adduce the peculiar nucleus, which in all was oblong, and did not disappear under any conditions of light. May

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we then regard them as nucleolated nuclei, or small nucleated cells? I confess that I can see no objection to this view; it is only to be regretted that it in no way throws light on the relation of the containing body to the contained, as to priority of origin, or necessary connexion of the one to the other. It is extremely interesting, however, to learn that albumen is of itself capable of undergoing a celluloid development. The last objects I shall notice, as observed in the preparation, are the scale-like bodies. There was only one situation in which I clearly recognised a group of them, though others existed scattered here and there. The group of scales was in close proximity to a parcel of fibres, and lay partly on a mass of the granular base. They appeared under the form of delicate laminæ, somewhat of a quadrangular figure, their borders irregular and serrated, and some few presented an imperfect nucleus; granules were likewise to be found on the surface of two or three. Were these of the nature of cells? This is a question which I cannot decide; it is possible they may be merely the result of a process of *flaking*, or of the fusion of granules precipitated together in small masses.

I have dwelt thus at length on the microscopic appearances of this highly interesting artificial preparation, because it seems to me that the importance of the subject cannot be exaggerated. It gives us indications of paths of investigation to be followed; and I will freely confess that the perusal of M. Melsen's memoir and the results of my examination of the specimen which he so very kindly placed at my disposal, have filled me with the highest hopes of seeing before long some large advances made in this hitherto almost unworked field of investigation. Recent chemical researches into the physiological history of organic bodies have done much to establish the paramount importance of albumen; and with the evidence now furnished us of its capability of undergoing histomorphosis into at least three distinct structural elements, I conceive that a most powerful stimulus has been given to experimental results into the foundation of the organic compounds, while we owe to M. Melsens clear indications of the road to be followed.

I feel that I owe some apology for dealing at such length with a subject already ably handled by so eminent a micrologist as M. Gluge. I will trust, however, to his kind indulgence to pardon the extent of my observations, which have solely for their aim to bring more prominently into relief what appeared to me the most interesting points of these admirable experiments. I may further add, that during a recent visit to Brussels, I had an opportunity of examining a very beautiful specimen of fibrine, prepared by M. Melsens by the process of continued washing; and I can entirely corroborate his statements as to its striking white color, when perfectly freed from fragments of blood-globules, and all traces of hematosine.—*Dublin Quarterly Journal of Medical Science*, February, 1852.

MEMOIR ON THE REPRODUCTION OF SEVERAL MINERAL COMPOUNDS.

BY M. BECQUEREL.

In the ordinary operations of chemistry, when it is desired to make bodies act on other bodies, it is customary to pulverise them, to dissolve them in a liquid, or to bring them to the state of igneous fusion; it is nearly impossible then to observe the effects of decomposition and recomposition due to slow actions, of which nature presents so many examples, as well as the electrical effects resulting from the immediate contact of these bodies, and which may concur, in certain cases, in giving rise or greater energy to the former.

In this chemistry differs, therefore, from electro-chemistry, applied to slow actions, inasmuch as the latter employs electricity subsidiarily for exciting affinities, or rendering them more effective, and as it requires the presence of three bodies, of which one, at least, must be in the solid, and another in the liquid state. Such is the point of view in which I have always regarded electro-chemistry, which furnishes means of analysis and of synthesis which may be turned to account in analysis. This kind of research has, besides, the advantage of making known the conditions necessary for solutions containing one or more combinations, to be able to re-act on insoluble compounds with which they are in contact.

The slow actions which have particularly attracted my attention are those which have commenced to be exerted as soon as the rocks and metallic and other substances which filled the veins and lodes came in contact with the mineral waters passing through all parts of the interior. Time then became a necessary element for the increase of the crystalised substances formed. Nature has this element infinitely at its disposal, whilst we, in our laboratories, can only employ it within very narrow limits,

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but sufficient, however, for obtaining well marked effects in a period of seven years, as the Academy will perceive from the results which I obtained in experiments undertaken in 1845 on the reproduction of mineral substances.

Among the processes by means of which this reproduction has been achieved by the humid way, and under the influence of slow actions, I will call to mind the following, which I described in a memoir presented to the Academy on the 26th of May, 1845. —*Extracted from Comptes Rendus des Séances de l'Academie des Sciences* (t. xx.)

FIRST PROCESS.

This process consists in making a potassa or soda solution of silica or alumina react slowly on a couple formed of a sheet of oxidisable metal, and of a copper or platinum wire, round which it is rolled, the whole enclosed in a phial corked and left to spontaneous action.

In 1845 an apparatus was arranged with a plate of amalgamated zinc surrounded by a copper wire, and a potassa solution of silica, marking 22 degrees of the areometer; the water was decomposed with a disengagement of hydrogen gas and formation of oxide of zinc, which was dissolved. Fifteen days after, we began to perceive on the plate of zinc very small regular octohedral crystals, having the composition

ZnO, HO.

The volume of these crystals augments with time, without, however, exceeding a certain limit, about 1 milimetre in breadth.

In operating with more or less concentrated alkaline solutions, it was perceived that the crystalisation was so much the more clear, and the crystals so much the larger, as the areometric degree did not exceed from 20 to 25 degrees. Other apparatus were arranged in 1845, by substituting for the zinc and copper couple a lead and copper couple, and by making the alkaline solution of 25 areometrical degrees. The lead was gradually attacked, the protoxide of lead formed was dissolved, and, after saturation, there was slowly deposited on the surface of the leaden plate crystals of the anhydrous protoxide of that metal. (PbO.)

These crystals, some of which are several millimetres in breadth, are transparent, of a greenish color, and give by trituration a yellowish powder. They are implanted in each other, and show only a portion of their extremities. Other indications concur in showing that these crystals are derived from a right rhomboidal prism.

SECOND PROCESS.

From the electro-chemical considerations contained in the above-mentioned memoir, I was led to make sulphuret of lead, or galena (PbS), react on a saturated solution of sulphate of copper and chloride of sodium, diluted with its own weight of distilled water, in order to effect the formation of various combinations of lead having analogies in nature.

In the month of May, 1845, I made several preparations with galena and mixtures of chloride of sodium and sulphate of copper, which were left to slow action until this day. The following are the products which were formed in the space of seven years either on the pieces of galena, or on the bottom or sides of the vessels.

1. Chloride of sodium, in cubic, cubo-octohedral, and even octohedral crystals, very clear and transparent, and from a few millimetres to 1 centimetre in breadth.

2. Chloride of lead in needles and in cubic crystals of a light yellow color, and of very pure form.

3. Sulphate of lead in cuneïform octohedrons, with several modifications, forms exactly similar to those of the crystals of sulphate of lead of Anglesea.

4. Chlorosulphate in needles.

5. Basic chloride in microscopical crystals disseminated here and there among all these products.

6. Black sulphuret of copper without any appearance of crystalisation.

All these products, which cover the pieces of galena, give to the latter the appearance of samples of ores as they come out of the veins.

If, in certain apparatus, chloride and chlorosulphate alone are formed, and in others crystalized chloride and sulphate of lead, it is doubtless owing to the proportions of sulphate of copper and chloride of sodium, and to the density of the solution.

I have found, indeed, that in a saturated solution of common salt and sulphate of copper, diluted with three times its bulk of water, into which dips a voltaic couple, formed of a piece of galena, surrounded by a platinum wire, there was formed, in the space of seven years, a considerable quantity of chloride of lead crystalised in cubes, without other products. I will add, that having placed in the same solution a piece of bibasic carbonate of copper (malachite), there was likewise deposited on it crystals of chloride of lead rather larger than those formed on the galena.

Nothing prevents the reactions which I have described above being produced in

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Nature. Indeed the rain waters which penetrate the veins and the lodes, formed of metallic compounds, are sometimes charged with chloride of sodium and sulphate of copper, arising from the decomposition of copper pyrites. The solutions which result from it, when once in contact with the sulphuret of lead (galena), react slowly on it, and give rise to the formation of the various compounds described above.

The processes which I have just explained have enabled me to obtain two other compounds; among others the carbonate of lead (PbO, CO^2); into a saturated solution of carbonate of soda and carbonate of copper, about 3 decilitres, was put a plate of lead 4 centimetres long and 2 wide, round which was rolled a platinum wire, to constitute a voltaic couple; the whole was placed in glass flask, closing imperfectly, and left to spontaneous action for seven years. The lead was gradually oxidised at the expense of the oxygen of the air; the oxide formed, being slightly soluble in water, reacted on the carbonate of copper, from which resulted hydrate of oxide of copper and carbonate of lead. The carbonate was in very small crystals, covering the sheet of lead. The form of these crystals appeared to be the same as that of the native carbonate of lead.

I have likewise obtained crystalised carbonate of lime (CaO, CO^2); for this purpose, the decomposition of a lime salt, very sparingly soluble in water, and very much diffused throughout nature, such as the sulphate of lime, was effected with bicarbonate of soda, a compound which is found in some mineral waters. Into the saturated or non-saturated solution of this salt we put plates of sulphate of lime (gypsum of Montmartre); these plates speedily lose their vitreous lustre, and are covered with small rhombohedral crystals belonging to the primitive form of carbonate of lime. These crystals are frequently covered with streaks which indicate the three principal clivages of the primitive rhombohedron. At the instant of contact, the sulphate of lime is dissolved, and immediately reacts on the bicarbonate. There is a disengagement of carbonic acid which remains, partly in solution, on account of the imperfect closing of the vessel. Sulphate of soda and carbonate of lime are also formed, so that the plates which are successively detached from the gypsum are formed of small rhombohedra adhering to each other, which does not admit of our supposing that their formation is due only to an ordinary double decomposition. It is probable that the solvent action of carbonic acid which is found in the solution aids in the production of the phenomenon. The effects which I have just described are manifested especially with solutions of bicarbonate at a low degree (2 degrees of the areometer).

In another work I shall make known the different insoluble and crystalised compounds of lime thus obtained.

The facts contained in this memoir give evidence of two principles by means of which may be reproduced a certain number of insoluble crystalised compounds similar to those which occur in nature. The first consists in slowly oxidising a body in a solution, on the constituent parts of which the oxide formed reacts, and whence result oxides and various crystallised insoluble compounds. The second relates to the slow reactions which occur when a very sparingly soluble combination is put in contact with a solution containing several combinations giving rise to a double decomposition. In this case, insoluble compounds are formed which crystalise.

I have endeavored, in the application which I have made of these principles to the reproduction of certain mineral substances, to combine the conditions which should concur in their formation in their ordinary position in the earth, in order to show that nature had employed similar means.—*Comptes Rendus*, No. 2, January 12, 1852.

RESEARCHES ON POPULINE.

BY M. PIRIA.

(Extract from a letter addressed to M. Dumas.)

You know that in 1830, Braconnot announced the discovery of a crystallised matter which he had extracted from the leaves and bark of the Populus Tremula, and which he called *populine*. I have just been studying this substance, and take the liberty of addressing you concerning it.

After having vainly endeavored to decompose populine by means of synaptase, I had recourse to other agents, and the reactions which I observed have led me to regard this substance as a complex grouping, resulting from the union of benzoïc acid, saligenine, and grape sugar, in a single molecule. The products of decomposition which are derived from it by the action of different re-agents are exactly the same as those which result from the metamorphoses of the secondary groupings which it contains. Thus, with a mixture of bichromate of potassa and sulphuric acid, populine produces hydroguret of salicyle in great abundance; by boiling with concen-

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trated nitric acid, it is converted into nitro-benzoïc, trinitro-phenic, and oxalic acids; finally, under the influence of the acids, it is converted into benzoic acid, saliretine, and grape sugar. I pass over in silence the other reactions which flow from the constitution mentioned.

The elementary composition of populine is represented by the formula $C^{40}H^{22}O^{16}+$ Aq. At 212° F. it loses its 4 equivalents of water, and becomes completely anhydrous. This formula results from the union of equal equivalents of benzoïc acid, saligenine, and sugar, with the elimination of 4 equivalents of water by the effect of the double coupling, as results from the following equation:— $C^{14}H^6O^4+C^{14}H^8O^4+C^{12}H^{12}O^{12}-4Aq=C^{40}H^{22}O^{16}$

This being established on one hand, you see that populine might be regarded as the result of the union of a molecule of benzoïc acid with a molecule of salicine, less 2 equivalents of water, as happens in all analagous cases. We should have indeed: $C^{26}H^{18}O^{14}+C^{14}H^6O^4-2HO=C^{40}H^{22}O^{16}$

This last mode of regarding its molecular constitution having shown to me the possibility of converting populine into salicine, I made some experiments with this view, in which my anticipations have been realised to an unexpected extent. It is sufficient, indeed, to boil populine with baryta water to obtain, in a few minutes, a perfectly limpid and colorless solution, which, after the separation of the excess of baryta by a current of carbonic acid, contains nothing but benzoate of baryta and salicine. The salicine thus prepared is divided under the influence of synaptase and the acids, like ordinary salicine, and acts absolutely in the same manner with the other re-agents. The analysis of artificial salicine gave me, in two experiments, the following numbers:—

Carbon	54.20	54.65
Hydrogen	6.36	6.41

which are similar to those found in the analysis of natural salicine.

When populine is dissolved without heat in ten or twelve times its weight of pure nitric acid of 1.30D., a new body is produced, which I call *benzo-helicine*, from its molecular constitution. Benzo-helicine is not decomposed by synaptase, but, under the influence of the acids and alkalis, it is divided into benzoïc acid, hydroguret of salicyle, and grape sugar. This body, consequently, is to helicine what populine is to salicine, and it would perhaps be proper to replace the word populine by that of benzo-salicine. Benzo-helicine is converted into helicine when it is boiled with caustic magnesia, which removes from it the benzoïc acid without altering the helicine produced.

Before concluding this already long letter, permit me to communicate to you another fact, doubtless unimportant, but which may furnish data to the chemists who may occupy themselves with the same subject. It is the existence of the homologue of acetone in the ethalic series. Ethalone is obtained with the greatest facility by rapidly distilling ethalic acid with an excess of slaked lime. To purify it, it is sufficient to crystalise it several times in boiling alcohol, which dissolves it so much the better, as it is more concentrated. It occurs in small pearly plates, the composition of which is:—

Carbon	82·46	82·94
Hydrogen	13·94	14·04

These results lead to the formula $C^{62}H^{62}O^2$, which would give:—

C^{62}	372	82·67
H^{62}	62	13·78
O^2	16	3·55
	450	100·00

Comptes Rendus, No. 4, January 26, 1852.

IMPROVED MODE OF PREPARING CAFFEIN.

BY H. J. VERSMANN, APOTHECARY, LUBEC.

THE use of coffee in Europe is not yet two hundred years old. It was first introduced into Paris in the year 1669. Since that date the consumption of coffee has gradually increased, and, especially in France and Germany, has reached to so great an extent, that coffee is one of the most important objects of commercial speculation; indeed, it is now a real article of diet. It is consumed not only by the higher classes of society, but more particularly by the middle and lower classes, to which it is now a necessary. The consumption of coffee, in the year 1840, in the Zollvérein, was equal to two pounds eleven loths (a loth in equal to ½ oz.) per caput. This is much exceeded in the Northern German States, where its price is not raised by a heavy duty, and where, therefore, the occasion does not exist for the employment of its substitutes —burnt chicory, grapes, &c. A proof of this assertion is to be found in the report from Rio Janeiro, that the consumption of Brazilian coffees, in Germany and Austria, during the past year, amounted to 71,479,040 pounds.

All substitutes for coffee fall in their object, inasmuch as they are wanting in that

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which particularly they should contain, the essential active ingredient, caffein. Coffee and caffein are seldom employed for medicinal purposes, probably less than they should be. Formerly coffee was employed in some countries as a remedy in ague, and it is very probably that caffein deserves commendation for this purpose. In many cases it may be preferred to quinine, as it is more easily borne by the system, and leaves no ill effects behind. Recently, caffein has been employed by a certain physician, in hysterical headaches, attended with other symptoms, and has given the author several occasions for the preparation of this substance.

The statements of the proportion of caffein in coffee have been so various, that it has seemed to the author desirable to contribute his own researches. He first confines himself to the reproduction of a few of these statements. Pfaff, who early directed his attention to the determination of the quantity of caffein in coffee, found that the fresh berry contains $\frac{1}{500}$th of caffein; Pagen states the proportion at five times as much; and Robiquet asserts that roasted coffee contains $\frac{1}{300}$th of caffein. In Wigger's *Grundriss der Pharmakognosie*, second edition, it is stated that Robiquet gives the following proportions of caffein in different kinds of coffee:—Martinico coffee, 6.4; Alexandrian, 4.4; Java, 4.4; Mocha, 4.0; Cayenne, 3.8; St. Domingo, 3.2 per cent. It is most probable that 0.64 per cent. is a common proportion, and that coffee cannot generally contain so large a quantity as above stated. In Liebig's *Handbuch der Chémie*, the following quantities are given from Robiquet and Boutron:—

	Grains of Caffein.
1 pound of Martinico coffee	32
1 „ Alexandrian	22
1 „ Java	22
1 „ Mocha	20
1 „ Cayenne	19
1 „ Domingo	16

The discrepancies in these statements may be explained on several grounds. First, the difference of the coffee, according to its commercial quality, and the character of the place where it was gathered; then the method of preparing the caffein, the care with which the coffee was bruised; and lastly, the quantity employed in the operation.

All the authors have prepared caffein from good Brazilian coffee, and have operated on quantities of five, ten, and one hundred pounds. In the preparation of caffein, the direction is usually given to boil the raw coffee-berries, to combine it with oxide of lead, and then to separate it by sulphuric acid. This plan the author has tried, but has found it rather unprofitable, and has gained but little profitable results. By the boiling, the gum, and the mucus with which the oil is combined in coffee were dissolved, and the separation of the pure caffein is rendered difficult. On the other hand, he recommends the following process, as simple and suitable to the purpose:—Ten parts of bruised coffee are mixed with two parts of caustic lime, previously converted into hydrate of lime. This mixture is placed in a displacement apparatus, with alcohol of 80°, until the fluid, which passes through no longer, furnishes evidence of the presence of caffein. The coffee is then roughly ground, and brought nearly to the state of a powder, and the refuse of the already once digested mixture from the displacement apparatus dried, and ground again, and, mixed with hydrate of lime, is once more macerated. The grinding is more easily effected after the coffee has been subjected to the operation of alcohol, having lost its horny quality, and the caffein is thus certainly extracted. The clear alcoholic fluid thus obtained is then to be distilled, and the refuse in the retort to be washed with warm water to separate the oil. The resulting fluid is then evaporated, until it forms a crystalline mass, which is to be placed on a thick filter, and the moisture expressed. The moisture, after evaporation, still furnishes some caffein. The impure caffein is freed from oil by pressure between folds of blotting paper, and purified by solution in water with animal charcoal, and is afterwards obtained in shining, white, silky crystals. In general, not more than three drachms were procured from five pounds of coffee, from ten pounds seven drachms, and from one hundred pounds, the largest quantity, viz, six ounces and four scruples of caffein; a proof that a large quantity must be operated upon if, in a quantitative respect, a satisfactory result is to be obtained. Thus it is seen that good Brazilian coffee contains 0.57 per cent. of caffein. At the same time it may be observed that it contains about ten per cent. of a green liquid oil, and two per cent. of a yellow, firm fat (Palmtin).—*Archiv der Pharmacie*, November, 1851.

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ESTIMATION OF THE QUANTITY OF PEROXIDE OF MANGANESE IN COMMERCIAL OXIDE OF MANGANESE, AND OF AVAILABLE CHLORINE IN BLEACHING POWDER.

BY DR. L. MÜLLER.

THERE are few substances used in the arts for which so many modes of valuation tests have been proposed as peroxide of manganese, and yet the operator feels the want of a method suitable to this purpose combining easy execution with a sufficient degree of accuracy. Dr. Müller considers that he has supplied this deficiency by the invention of the following method. It is based on the reducing action exerted by protochloride of tin on a number of bodies, reducing oxides to suboxides, chlorides to subchlorides, and particularly of reducing perchloride of iron to the state of protochloride, whilst passing itself, entirely or partially into perchloride of tin. It is easy to recognise this action of the protochloride of tin upon perchloride of iron by the change of color which a solution of the latter experiences on the addition of the former; the brown, brownish-yellow, and yellow colors of the perchloride of iron gradually disappear, and at length a colorless or very light green solution remains, all the iron in which is in the state of protochloride. The change of color may be rendered still more striking to the eye by adding a few drops of a solution of sulphocyanide of potassium to the solution of perchloride of iron before the experiment; sulphocyanide of iron is formed, which communicates to the solution an intense dark red color, which disappears on the addition of a sufficient quantity of protochloride of tin.

It is now evident, as had already been pointed out by Professor Schulze, of Rostock, that this mutual reaction of protochloride of tin and perchloride of iron may be turned to account for the analysis of a solution of one of these salts by a solution of the other, in which the proportion of salt is known; for in order that, after the mixture, only perchloride of tin and protochloride of iron may be present, there must have been, before the mixture, a definite relation between the quantities of protochloride of tin and perchloride of iron. Thus there results from

$$SnCl \text{ and } Fe^2Cl^3$$

$$SnCl^2 \text{ and } Fe^2Cl^2 = 2FeCl,$$ or

1178·574 protochloride of tin and 1990·894 perchloride of iron give 1621·854 perchloride of tin and 1547·614 protochloride of iron.

In order to profit by this behavior of protochloride of tin and perchloride of iron two courses might be followed. First, a solution of protochloride of iron might be converted into perchloride by the action of the chlorine developed from hydrochloric acid by the oxide of manganese to be valued, and then the quantity of perchloride of iron thus formed in this solution determined by means of a solution containing a known proportion of protochloride of tin. This proceeding, however, is not practically applicable, since chlorine is not absorbed by a solution of protochloride of iron with sufficient rapidity to prevent all loss. By the second method, the chlorine evolved may be passed through a solution of protochloride of tin, and the perchloride produced estimated by means of a solution of perchloride of iron of known strength. This second method has proved perfectly applicable in practice, as the chlorine is rapidly and completely absorbed by a solution of protochloride of tin.

The following is the mode of conducting the examination:—A solution of perchloride of iron, free from nitric acid and uncombined chlorine, is tested to determine the per-centage of perchloride which it contains by precipitating in the usual way the iron from 50 cubic centimetres of the solution by means of ammonia, and determining the quantity as peroxide. Such a solution, chemically pure and of known strength, is, as we shall soon see, necessary only in the first instance. Next, protochloride of tin is dissolved in water, and hydrochloric acid added until the solution becomes quite clear. This solution is added, drop by drop, to 50 cubic centimetres of the solution of perchloride of iron, to which a few drops of sulphocyanide of potassium have been added, until the color disappears. In this way the quantity of protochloride of tin in a given quantity of the solution is ascertained; for, supposing that the solution of perchloride of iron contains in 50 cubic centimetres 19·9 grammes of perchloride, there would be 11·78 grammes of protochloride of tin in the quantity of solution employed. This calculation of the quantity of salt in the solution of protochloride of tin is, however, unnecessary in the estimation of oxide of manganese when the number of degrees is known which are requisite for the reduction of a certain quantity of perchloride of iron into protochloride; it is however indispensable to test the solution of protochloride of tin before each estimation of oxide of manganese, in consequence of its tendency to form, by the absorption

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of oxygen, a basic salt, which precipitates. After this preliminary examination, a double quantity of the solution of protochloride of tin is poured into a tube graduated into 200 half parts, the tube filled to about 90 with water, and then the chlorine developed by a determined quantity of oxide of manganese passed through it. The quantity of the oxide of manganese to be used in the estimation is regulated by the concentration of the solution of perchloride of iron; and indeed so much oxide must always be used for the examination, that if it were pure peroxide of manganese, it would set free as much chlorine as would be evolved by 50 cubic centimetres of the solution of perchloride of iron in its conversion into protochloride. Or, as 1 milligramme of perchloride of iron (Fe^2Cl^3) evolves 1 milligramme of chlorine in passing into protochloride, so 1 milligramme of peroxide of manganese (MnO^2) is also capable of developing 1 milligramme of chlorine; consequently the quantities of perchloride of iron and oxide of manganese must always be in the same proportion to each other as their equivalents. If, therefore, 50 cubic centimetres of the solution of perchloride of iron contain a grammes of perchloride, then the formula

$$1990{\cdot}894 : 544{\cdot}684 :: a : x$$

$$x = \frac{544{\cdot}684 \cdot a}{1990{\cdot}894} = 0{\cdot}274\, a$$

gives the quantity of oxide of manganese to be employed.

This quantity of oxide is introduced into a small glass flask, in the neck of which a tube is inserted, by means of a well-fitted cork, the requisite quantity of hydrochloric acid added, the mixture moderately warmed in a sand-bath, and the chlorine evolved led into the solution of protochloride of tin; after the evolution of gas has ceased, the conducting tube is removed from the tin solution, water added to this up to the hundredth part-mark, and then examined, to ascertain how many parts of this solution, acted on by chlorine, are necessary in order to again convert 50 cubic centimetres of the solution of perchloride of iron, after the addition of a few drops of sulphocyanide of potassium, into protochloride of iron. How the per-centage of peroxide of manganese in the commercial oxide is calculated from the number of parts of this altered tin solution that are used, will readily be seen from the following:—

Since this tin solution originally contained twice as much protochloride of tin as was necessary for the reduction of the perchloride of iron contained in 50 cubic centimetres of the iron solution, it is evident that the commercial oxide would contain no peroxide at all, when only half the altered tin solution, or 50 parts have been consumed in effecting this change; if, however, more were required, it would be because a part of the protochloride of tin was converted into perchloride by the action of the chlorine evolved, and consequently the solution rendered weaker in relation to the protochloride of tin; and it is equally obvious that 100 parts consumed represent 100 per cent. of peroxide of manganese. The per-centage of peroxide represented by the quantities of solution between 50 and 100 parts is ascertained by simple calculation. Let n be the number of parts used; now these contain just as much protochloride of tin as 50 parts of the unaltered solution, and the quantity of protochloride in the altered solution is to that in the unaltered as 50 to n, or the former is equal to $\frac{50}{n}$ of the latter; consequently the quantity of the perchloride of tin found amounts to $\frac{n-50}{n}$, or in per-cents. of the whole quantity $100\,\frac{n-50}{n}$; since, however, the quantity of the commercial oxide used, even in the best samples, could only convert half of the protochloride of tin into perchloride, the quantity of perchloride of tin formed must be calculated as per cents. of half the tin solution, and there is obtained for this 200 $\frac{n-50}{n}$, which are at the same time the per-centages of peroxide of manganese. Thus, for example, if 62·5 parts of the altered solution have been used in order to convert 50 cubic centimetres of solution of perchloride of iron into protochloride, the commercial oxide of manganese will contain

$$200\,\frac{62{\cdot}5-50}{62{\cdot}5} = 200 \cdot \frac{12{\cdot}5}{62{\cdot}5} = 40 \text{ per cent.}$$

of peroxide of manganese. The following table obviates the necessity of this calculation:—

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TABLE

SHOWING THE PER-CENTAGE OF PEROXIDE IN A SAMPLE OF MANGANESE WHEN THE QUANTITIES USED IN THE EXAMINATION ARE AS 1990·894 PERCHLORIDE OF IRON : 2357·148 PROTOCHLORIDE OF TIN : 544·684 MANGANESE.

No. of degrees of tin solution consumed.	Per-cent. of peroxide of manganese	No. of degrees of tin solution consumed.	Per-cent. of peroxide of manganese	No. of degrees of tin solution consumed.	Per-cents. of peroxide of manganese	No. of degrees of tin solution consumed	Per-cents. of peroxide of manganese
50	0·00	62·5	40·00	75	66·66	87·5	85·70
50·5	1·98	63	41·26	75·5	67·54	88	86·36
51	3·92	63·5	42·50	76	68·42	88·5	87·00
51·5	5·84	64	43·75	76·5	69·28	89	87·64
52	7·68	64·5	44·96	77	70·12	89·5	88·26
52·5	9·52	65	46·14	77·5	70·96	90	88·88
53	11 32	65·5	47·32	78	71·78	90·5	89·50
53·5	13·14	66	48·48	78·5	72·60	91	90·10
54	14·82	66·5	49·62	79	73·40	91·5	90·70
54·5	16·50	67	50·74	79·5	74·20	92	91·30
55	18·18	67·5	51·84	80	75·00	92·5	91·88
55·5	19·82	68	52·94	80·5	76·02	93	92·46
56	21·42	68·5	54·00	81	76·54	93·5	93·06
56·5	23·00	69	55·06	81·5	77·32	94	93·62
57	24·56	69·5	56·10	82	78·04	94·5	94·18
57·5	26·08	70	57·14	82·5	78·78	95	94·72
58	27·58	70·5	58·14	83	79·52	95·5	95·28
58·5	29·06	71	59·14	83·5	80·24	96	95·82
59	30·50	71·5	60·14	84	80·94	96·5	96·38
59·5	31·92	72	61·10	84·5	81·42	97	96·90
60	33 32	72·5	62·20	85	82·34	97·5	97·42
60·5	34·70	73	63·00	85·5	83·04	98	97·94
61	36·06	73·5	63·94	86	83·72	98·5	98·46
61·5	37·38	74	64·86	86·5	84·38	99	98·98
62	38·70	74·5	65·76	87	85·28	99·5	99·50
						100	100·000

The manipulation in this valuation of commercial oxide of manganese is so simple, and its advantages over all others so obvious, that a more specific indication appears superfluous*; and it will therefore suffice to mention here, that the detailed analysis of the solution of perchloride of iron is necessary only at the commencement of such examinations. If, for example, the composition of a solution of perchloride is known, it is easy to determine the quantity of perchloride in a second solution by simply converting equal quantities of both into protochloride by means of the same tin solution; the quantities of perchloride of iron will be directly as the necessary quantities of tin solution. If, for this purpose, 50 cubic centimetres of the solution of perchloride of iron are employed, it is only requisite to multiply the quantity of perchloride found in the new solution by 0·274 in order to obtain the quantity of commercial oxide to be used in the examination.

We now proceed to the application of protochloride of tin to the determination of the quantity of available chlorine contained in bleaching powder. After the foregoing remarks, this may be very briefly described. A solution of protochloride of tin is again tested by means of a solution of perchloride of iron of known strength; double the quantity necessary for converting 50 cubic

* The author's method of estimating the value of commercial oxide of manganese is ingenious and accurate, and may admit of application in many cases; it has, however, no advantage over the ordinary methods of estimation, especially that of Will and Fresenius; it does not excel that, either in simplicity or accuracy. With regard to the determination of the quantity of bleaching chlorine in bleaching powder, a normal solution of protoxide of iron, whose quantity of protoxide is determined, after the addition of a known quantity of the solution of bleaching powder, by Marguerite's method, is more simple, and gives more accurate results.—LIEBIG.

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centimetres of the solution of perchloride of iron into protochloride is poured into a tube divided into 100 parts; to this is immediately added the solution of a determinate quantity of bleaching powder, and the tube filled with water up to the 100th degree. The otherwise bleaching chlorine here effects the formation of perchloride of tin, the quantity of which is again easily determined by the solution of perchloride of iron. Bleaching powder, even the best, does not contain more than 30 per cent. of available chlorine; however, in the following table a bleaching powder with 50 per cent. is assumed as a standard of comparison, partly for the purpose of using it for other bleaching salts, and partly in order to obtain suitable data for the per-centages between 20 and 30: 443·28 chlorine must therefore be considered as 50 per cent., and thence the quantity of bleaching powder calculated which is capable of converting an equal quantity of protochloride of tin into perchloride, as is 1990·894 perchloride of iron, whence the number 886·56. The quantity of the bleaching powder to be used in each case is consequently calculated from the quantity a of the perchloride of iron contained in 50 cubic centimetres, by means of the proportion

$$1990{\cdot}894 : 886{\cdot}56 :: a : x.$$

$$x = \frac{886{\cdot}56}{1990{\cdot}894} a = 0{\cdot}446a.$$

It is again evident, from the quantities of the individual substances selected, that in the valuation of the mixed solution of protochloride of tin and bleaching powder by 50 cubic centimetres of solution of perchloride, 50 parts represent 0, and 100 parts 50 per cent. of chlorine; but the calculation of the per-centage from the consumption of parts between 50 and 100 is effected by the formula

$$100 \frac{n-50}{n}.$$

In the following table this calculation is carried out for each individual part:—

TABLE

SHOWING THE PER-CENTAGE OF AVAILABLE CHLORINE IN A SAMPLE OF CHLORIDE OF LIME WHEN THE QUANTITIES USED IN THE EXAMINATION ARE AS 1990·894 PEOCHLORIDE OF IRON : 2357·148 PROTOCHLORIDE OF TIN : 886·56 CHLORIDE OF LIME.

No. of degrees of tin solution consumed.	Per-centage of available chlorine.	No. of degrees of tin solution consumed.	Per-centage of available chlorine.
50	0	76	34·210
51	1·960	77	35·065
52	3·846	78	35·897
53	5·660	79	36·708
54	7·407	80	37·500
55	9·090	81	38·271
56	10·714	82	39·024
57	12·280	83	39·759
58	13·793	84	40·476
59	15·254	85	41·176
60	16·666	86	41·860
61	18·032	87	42·528
62	19·354	88	43·181
63	20·634	89	43·820
64	21·875	90	44·444
65	23·076	91	45·054
66	24·242	92	45·760
67	25·373	93	46·236
68	26·470	94	46·808
69	27·536	95	47·368
70	28·571	96	47·916
71	29·577	97	48·453
72	30·555	98	48·979
73	31·506	99	49·494
74	32·432	100	50·000
75	33·333		

Annalen der Chemie und Pharmacie.

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MEANS OF DETECTING THE PRESENCE OF TRACES OF PHOSPHORIC ACID.

BY M. M. STRUVE AND SVANBERG.

WHEN we take pure molybdate of ammonia, and pour into it a few drops of phosphate of soda, heat, and add an excess of nitric or hydrochloric acid, there is formed a very bright yellow precipitate of quinti-molybdate of ammonia, thus constituted:—

Ammonia and water	9.488
Phosphoric acid	3·631
Molybdic acid	86·881
	100·000

Thus, phosphoric acid appears to be obstinately attached to the molybdic acid which carries it into its combinations.

Professor Rose prefers the employment of nitric acid to that of hydrochloric acid.

The molybdate of ammonia which thus serves as a test for phosphoric acid is prepared directly by dissolving molybdic acid in an excess of ammonia.—*Journal de Chimie Médicale*, February, 1852.

PRESENCE OF SUGAR IN THE URINE OF HYSTERICAL AND EPILEPTIC PERSONS.

BY SENOR ALVARO REYNOSO.

M. MICHÉA, at the sitting of December 15, 1851, presented a note, in which, contrary to my experiments, he says he has not found sugar in the urine of epileptic and hysterical persons after the attacks.

I have repeated my experiments, and have always found sugar in these urines.

The difference which exists between M. Michéa's results and mine are owing to his having used a much less delicate process for detecting sugar than that which I employed.

1. The process by means of potassa, employed by M. Michéa, is less delicate than M. Barreswill's liquor (tartrate of copper and potassa). To prove this, it is sufficient to crush in a glass of water a seed of dried raisin. By taking half of this water, and treating it with potassa, no reaction is perceived, whilst the other half, treated with nitrate of copper and potassa, gives an abundant precipitate of red protoxide of copper.

It is necessary always to operate on urine previously treated with acetate of lead and concentrated.

If we crush a seed of dried raisin in water, divide this water into two portions, and dilute the one with ordinary urine, and the other with a quantity of water, equal to that of the urine, we shall find that, by boiling the portion diluted with urine simply with the tartrate of copper and potassa, we shall have a dirty, and not very appreciable precipitate, whilst if it be previously heated with acetate of lead, we shall have as clear a reaction as if it had been diluted with water only.

Thus it is necessary to commence by treating the urine with subacetate of lead, to filter, and to precipitate the excess of lead with carbonate of soda; it is filtered, and then concentrated, and boiled with M. Barreswill's liquor. It is necessary to operation, on at least 30gr. of urine, in order to have very clear reactions.

Moreover, if M. Michéa retains any doubt concerning these experiments, I am ready to repeat them in his presence—*Comptes Rendus*, No. 1, January 5, 1852.

ON THE EXISTENCE OF ORGANIC MATTER IN STALACTITES AND STALAGMITES, FORMING CRYSTALLISED AND AMORPHOUS CRENATE OF LIME.

BY DAVID A. WELLS.

IN the eighth chapter of Liebig's Agricultural Chemistry, edited by Playfair, there is given the result of some examinations of stalactites from caverns in Germany, and from the vaults of old castles upon the Rhine, made with the view of ascertaining the fact of the presence or absence of organic matter in these bodies, either combined or uncombined.

The result may be stated in the words of the author, Prof. Liebig. The stalactites from the caverns "contain no traces of vegetable matter, and no humic acid, and may be heated to redness without becoming black." In the stalactites from the vaults and cellars of old castles, he says, "we could not detect the smallest traces" of humic acid. "There could scarcely be found a more clear and convincing proof of the absence of humic acid of chemists in common vegetable mould." Under the term humic acid, Prof. Liebig undoubtedly means to include all those organic acids arising from the decomposition of vegetable matter, and which have received the names of crenic, apocrenic, geic, and humic acids.

Having been informed by Dr. A. A. Hayes of Boston that he had in numerous examinations arrived at results directly opposed to those of Prof. Liebig, I was induced at his suggestion to make an

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examination of a large number of stalactites and stalagmites obtained from various localities, with reference solely to the presence of organic matter in these bodies.

The specimens examined were all from caverns, or rock formations, and were obtained from various parts of the United States, from Trieste in Austria, Malta, and the Sandwich Islands. In color they varied from an almost pure white to red, yellow, and brown of different shades; and in crystalline character, from a structure resembling arragonite to a variety entirely wanting in symmetrical arrangement, or a mere incrustation. The specimens were dissolved in dilute hydrochloric acid, the flocculent matter separated, collected, and washed, boiled in caustic potash, carbonate of ammonia, or carbonate of soda, and then tested in the usual way for crenic and apocrenic acids by acetate of copper and carbonate of ammonia. In all the varieties, with one exception, abundant flocculent organic matter was separated, which, on testing, gave evidence of crenic acid in considerable quantities, with doubtful traces of apocrenic acid. The exception alluded to was the specimen examined from Trieste, which did not afford any appreciable flocculent matter on dissolving in acid. The greatest quantity of organic matter was found in stalactites of a deep yellow color, highly crystalline and uniform in character, and in the portions examined perfectly homogeneous and free from layers, or intervening bands indicating different periods and changes in deposition. As the presence of iron could not be found in the acid solution, it is inferred that the color of these yellow stalactites must be owing in great part to combined organic matter, existing as crenate of lime. In specimens like the spar ornaments from the Rock of Gibraltar, with which all are familiar, the coloring and delicate shading is also probably due to organic matter.

Dr. Hayes informs me that he has also found organic matter in arragonite in sufficient quantity to separate in flakes, while the specimen was dissolving in acid.

From these statements, it must, I think, be inferred, contrary to the view of Liebig, that organic matter does exist in stalactites generally, as an acid combined with the lime, and imparting to them their various colors. I would by no means call in question the accuracy of the experiments of Prof. Liebig, further than that, as far as my observations extend, crenic acid, in the presence of lime, and combined with it, passes over like oxalates, upon heating, into carbonates, without perceptible blackening.

It may here be added, that Prof. Johnston, of England, describes a compound of alumina with crenic acid, occurring in caves of granite upon the coast of Cornwall. This mineral has received the name of Pigotite, and is observed in places where the surface-water trickles down over the granite rocks. From this it may not be inappropriate to apply the term *crenite* to those lime formations in which crenic acid occurs in considerable quantities.

Results similar to those announced above have been obtained by Dr. C. T. Jackson, as well as by Dr. Hayes of Boston. Dr. J. Lawrence Smith informs me that he has frequently met with crenic acid in lime concretions from Asia Minor, and its existence in stalactites was also announced by Dr. Emmons of Albany some years since. My results can therefore be considered but as the verification of those obtained by others.—*Silliman's Journal*, Jan. 1852,

CONVERSION OF MANNITE INTO SUGAR.

BY M. L'HERMITE.

THE essential difference which exists, as to elementary composition, between sugar and mannite, consists in a slight excess of hydrogen which the latter contains for the same quantity of oxygen. Considering, besides, the whole of the affinities which connect together these proximate principles of vegetables, we must expect to see, in given conditions, one converted into the other. This conversion does not seem yet to have been studied.

Recent and very pure mannite does not undergo alcoholic fermentation; but, in a long time, a peculiar alteration takes place. From white, opaque, dry, and almost friable, it becomes red, transparent, and glutinous. It is then so hygrometric, as to dissolve in water, which it attracts from the atmosphere; and this solution, in contact with beer yeast, is very easily converted into alcohol and carbonic acid.

This explains why sugar has been found in the analysis of manna.

If, under an oxidising influence, mannite can pass to the state of sugar, there is no doubt that it can be produced by the action of a deoxidising cause on sugar itself; that it is thus, for example, that it is formed in beet-root, sugar left to viscid fermentation—*Comptes Rendus*, No. 3, January 19, 1852.

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II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

PROPOSAL FOR THE FORMATION OF A PHOTOGRAPHICAL SOCIETY.

It affords us much pleasure to be enabled to inform our readers that active measures are now being taken for the formation of a Society, the object of which is, the advancement of the beautiful art of Photography. The want of such a Society has long been experienced, and we feel assured that all interested in the art, whether professionally or as amateurs, will hail with delight its formation and hasten to avail themselves of its advantages. The number of photographists in this country is very great, and the Society will doubtless muster a long list of members as soon as it is fully formed, and certainly it will be joined by all of any note, or who, if not publicly known, are at least desirous of advancing photography and of perfecting themselves in the knowledge and practice of it.

The following circular is being sent to all photographists whose addresses are known to the projectors of the Society. We insert it for the benefit of those readers of this journal who may not have received it, earnestly calling upon them to render all the assistance in their power to advance the accomplishment of an object which must confer so much benefit on the photographic art.

During the few days that will elapse between the writing of this notice and its reaching the hands of our readers, some further progress will be made. The fullest information may be obtained by application to the Editors of The Chemist, 23, Paternoster Row, London; or to R. Fenton, Esq., 2, Albert Terrace, Regent's Park, or at 50, King William Street, City.

PROPOSAL FOR THE FORMATION OF A PHOTOGRAPHICAL SOCIETY.

"The science of photography, gradually progressing for several years, seems to have advanced at a more rapid pace during and since the Exhibition of 1851. Its lovers and students in all parts of Europe were brought into more immediate and frequent communication.

"Ideas of theory and methods of practice were interchanged; the pleasure and the instruction were mutual. In order that this temporary, may become the normal, condition of the art and of its professors, it is proposed to unite in a common society, with a fixed place of meeting, and a regular official organisation, all those gentlemen whose taste has led them to the cultivation of this branch of natural science.

"As the object proposed is not only to form a pleasant and convenient photographic club, but a society that shall be as advantageous for the art as is the Geographical Society to the advancement of knowledge in its department, it follows necessarily that it shall include amongst its members men of all ranks of life; that while men of eminence, from their fortune, social position, or scientific reputation, will be welcomed, no photographer of respectability in his particular sphere of life will be rejected.

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"The society, then, will consist of those eminent in the study of natural philosophy, of opticians, chemists, artists, and practical photographers, professional and amateur. It will admit both town and country members.

"It is proposed that the society should have appropriate premises, fitted up with laboratory, glass operating room, and salon in which to hold its meetings. That such meetings should be periodically held, for the purpose of hearing and discussing written or verbal communications on the subject of photography, receiving and verifying claims as to priority of invention, and for the exhibition and comparison of pictures produced by different applications of photographic principles, making known improvements in the construction of cameras and lenses, and, in fine, promoting by emulation and comparison the progress of the art.

"That the proceedings of the society shall be published regularly in some acknowledged organ, which shall be sent to all subscribing members.

"That a library of works bearing upon the history, or tending to the elucidation, of the principles of the science be formed upon the premises, and at the expense of the society; to be used by the members, subject to such rules as may hereafter be agreed upon.

"That the society should publish an annual album, of which each member should receive a copy who had contributed a good negative photograph to its formation, other members having to pay.

"Before any progress can be made in the organisation of such a society as the foregoing, it is necessary first to ascertain the amount of support which it would be likely to obtain.—If those gentlemen, therefore, who feel inclined to become members of such a society, will send in their names and addressses to R. Fenton, Esq., 2, Albert Terrace, Regent's Park, or at 50, King William Street, City, together with any suggestion which may occur to them individually, on the perusal of this outline of a plan, arrangements will be made, as soon as a sufficient number of persons have sent in their names, to hold a meeting in some central situation, to which they will be invited, to discuss the matter and to elect a committee for the organisation of a society.

"After the society has been once organised, persons who may in future wish to become members will have to be proposed and seconded, a majority of votes deciding their election.

"An entrance fee of 2*l.* 2*s.* is proposed, and a yearly subscription of 1*l.* 1*s.*"

PHOTOGRAPHY ON ARTIFICIAL IVORY.

BY M. M. BOUET AND MANTE.

THIS matter, according to the statement of the authors, in the letter accompanying the specimens sent to the Academy of Science, is capable of receiving a polish as perfect as the silver plate, and thus can preserve all the fineness of the cliché, not being cottony, and not disintegrating in the preparations like paper. One great advantage which it possesses is, that when prepared, it may be kept for months without undergoing any alteration.

PREPARATION OF THE PLATES OF FICTITIOUS IVORY.

Before submitting the plate to the first bath, it is cleaned with very fine scouring paper, which removes all traces of grease, and facilitates imbibition. In this state it is plunged into the following solution, and left in it for about a minute:—

	grammes.
No. 1 Hydrochlorate of ammonia	20
Filtered water	200

When it is removed from this solution, it is suspended by means of a small hole previously made in one corner, and allowed to dry completely, and when it has no more liquid in its surface, it is put into the second bath.

	grammes.
Nitrate of silver	40
Distilled water	200

It is left in this bath for the same time as in the first, and dried in the same manner, of course protected from the light. When the plate is quite dry, it may be used as it is, or polished with a piece of cotton wool steeped in alcohol and tripoli. When it has acquired in the light rather more force

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than is desired, it is removed and washed in water, and afterwards fixed with hyposulphite with or without heat.

	grammes.
Hyposulphite of soda	20
Filtered water	100

When the proof has acquired the desired tone, it is washed in a large quantity of water, in order to dissolve all the hyposulphite which it may contain. It is suspended to allow as much as possible of the water to drain off, and, before it is quite dry, it is pressed between two small and thin pieces of white wood, which extract all moisture, and cause it to retain its proper form in drying.—*Comptes Rendus*, No. 2, January 12, 1852.

PREPARATION OF TEA.

BY BERTHOLD SEEMANN.

In the *Manual of Scientific Inquiry* you ask whether, in the northern provinces of China, Indigo or any other vegetable dye is used in coloring green tea? Whether different processes of dyeing are pursued in the north from those of the south I cannot say; but it is certain that around Canton, whence great quantities are annually exported, the green tea is dyed with Prussian blue, tumeric, and gypsum, all reduced into fine powder. The process is well described by Sir John F. Davis (*The Chinese*, vol. iii. p. 244, *et seq.*) who, however, falls into the strange mistake of supposing the whole proceeding of coloring to be an adulteration, and leaves his readers to infer that it is only occasionally done in order to meet the urgency of the demand, while it is now very well known that all the green tea of Canton has assumed that color by artificial dyeing. I had heard so much about tea—copper-plates, picking of the leaves, rolling them up with the fingers, boiling them in hot water, &c. &c.—that I became anxious to see with my own eyes the process of manufacture, of which the various books had given me such a confused idea. One of the great merchants conducted me, not only to his own, but also to another establishment, where the preparation of the different sorts was going forward. There was no concealment or mysterious proceeding; everything was conducted openly, and exhibited with great civility; indeed, from all I saw in the country, I am almost inclined to conclude that either the Chinese have greatly altered, or their wish to conceal and mystify everything, of which so much has been said, never existed.

The tea is brought to Canton unprepared. After its arrival, it is first subjected to cleaning. Women and children are employed to pick out the pieces of twigs, seeds, and other impurities with which it happens to be intermixed. The only sorts which may be called natural are those gathered at different seasons; the rest are prepared by artificial means. Without entering into a description of all these processes, it may suffice to take one as an example. A quantity of *Bohea Saushung* was thrown into a spherical iron pan kept hot by means of a fire beneath. These leaves were constantly stirred about until they became thoroughly heated, when the dyes above mentioned were added, viz., to about twenty pounds of tea, one spoonful of gypsum, one of tumeric, and two or even three of Prussian blue. The leaves instantly changed into a bluish green, and having been stirred for a few minutes, were taken out. They, of course, had shrivelled, and assumed different shapes from the heat. The different kinds were produced by sifting. The small longish leaves fell through the first sieve, and formed Young Hyson, while those which had a roundish granular shape fell through last, and constituted Choo-cha, or Gunpowder.—*Hooker's Journal of Botany.*

ON THE TREATMENT OF FAT FOR THE PREPARATION OF CANDLES.

BY MM. MASSE AND TREBOULLET, OF NEUILLY.

It is known that fat may be made to acquire a soapy character by the influence of sulphuric acid. In the manufacture of candles the fat is heated with sulphuric acid, or is subjected to mechanical friction therewith; it is then washed, and the mass being placed in a still, is heated to between 200° and 250°, to drive off the aqueous vapor, and with it the fatty acids. With palm-oil, the effect of this treatment is as follows:—Palm-oil melts at 30°; after the action of sulphuric acid at 38°; after the washing with water at 44·5°; after the distillation at 46°. The first product of distillation liquefies at 54·5°, the point of liquefaction then sinks, and the product comes gradually more and more to have a tendency to crystallise. If the entire product be pressed together, the mass has a melting-point of 54·5°, the same as that which first passed over. Other fats present considerable differences in these respects. A presentation of these experiments has been requested by a commission.—*Bulletin de la Societé l'Encouragement*, July, 1851, and *Chemisch-Pharmaceutisch. Central-Blatt*, Nov. 1851.

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SUMMARY OF THE EXPERIMENTS MADE BY THE PRI

Medium of the roots	Nos. of Experiments.	Silicic acid.	Potassa.	Chloride of potassium.	Carbonate of soda.	Carbonate of lime.	Phosphate of lime.	Sulphate of lime.	Ammoniaco-magnesian phosphate.	Sulphate of potassa.	Carbonate of magnesia.	Magnetic oxide of iron.	Peroxide of iron.	Hydrated peroxide of iron.	Phosphate of iron.	Carbonate of manganese.
Sand	I.	,,	,,	,,	,,	..	..	..	..	..	..	..	..	..	..	..
Sand	II.	,,	,,	,,	,,	..	..	..	..	..	..	..	..	..	..	..
Quartz	III.	,,	,,	,,	,,	..	..	..	..	..	..	..	..	..	..	..
Sand	IV.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	..
Sand	V.	0,035	0,018	,,	,,	..	..	..	0,03	0,02	0,02	0,025	..	..	..	..
Quartz	VI.	0,035	0,018	,,	,,	..	..	..	0,03	0,02	0,02	0,025	..	..	..	0,00
Sand	VII.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	..	0,025	..	..	..	..
Sand	VIII.	0,05	,,	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	..
Quartz	IX.	,,	,,	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	0,00
Sand	X.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	..
Sand	XI.	0,035	0,018	,,	,,	0,1	0,03	..	..	..	0,02	0,025	..	..	..	..
Sand	XII.	0,035	0,018	,,	,,	0,1	0,04	0,03	..	..	0,02	..	..	..	..	..
Rock crystal.	XIII.	0,017	0,009	,,	,,	0,2	0,04	0,04	..	..	0,02	..	..	..	..	..
id	XIV.	0,017	0,009	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
Quartz	XV.	0,026	0,013	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
Quartz	XV. bis.	0,026	0,013	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	0,00
Quartz	XVI.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	..
Quartz	XVII.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	0,05	..
Rock crystal.	XVIII.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
id	XIX.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	0,00
id	XX.	0,035	0,018	,,	,,	0,2	0,04	0,03	..	..	0,02	0,01	..	..	..	0,00
Quartz	XXI.	0,030	0,020	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	00,1	..	..
Quartz	XXII.	0,031	,,	,,	0,013	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	0,00
Quartz	XXIII.	0,026	0,013	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
Quartz	XXIV.	0,026	0,013	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	00,6	..	0,00
Quartz	XXV.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	0,0
Quartz	XXVI.	0,026	0,013	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
Rock crystal.	XXVII.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	0,00
Quartz	XXVIII.	0,026	0,013	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
Quartz	XXIX.	0,035	0,018	,,	,,	0,1	0,05	0,03	..	..	0,02	..	..	..	..	..
Quartz	XXX.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	..	0,1	..	..	..
Quartz	XXXI.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	0,00
Quartz	XXXII.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	00,6	..	0,00
River sand..	XXXIII.	0,017	0,009	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
River sand..	XXXIV.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
River sand*.	XXXV.	0,038	0,016	,,	,,	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
River sand..	XXXVI.	0,035	0,018	0,005	0,001	0,1	0,03	0,03	..	..	0,02	0·025‡	..	..	..	..
River sand..	XXXVII.	0,035	0,018	0,005	0,001	0,1	0,03	0,03	..	..	0,02	..	..	..	..	..
Flint stone..	XXXVIII.	0,035	0,018	0,005	0,001	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	..
Carbonate of lime.....	XXXIX.	0,04	0,019	,,	,,	28,0	0,04	0,03	..	..	0,02	..	..	..	..	0,00
Carbonate of lime†	XL.	0,035	0,018	,,	,,	22,0	0,04	0,03	..	..	0,02	..	..	..	..	..
Rock crystal.	XLI.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,025	..	..	..	0,00
Sand.....	XLII.	Ashes of two vigorous oat-plants, grown in the fields, with the ashes o														
Silicic acid..	XLIII.	0,035	0,018	,,	,,	0,1	0,04	0,03	..	..	0,02	0,03	..	..	..	..
Silicic acid..	XLIV.	0,035	0,018	,,	,,	0,1	0,03	0,03	..	..	0,02	0,03	..	..	..	..
Porcelain....	XLV.	0,047	0,020	,,	,,	0,14	0,04	0,05	..	..	0,01	iron.	..	..	..	0,00

* The sand of Experiment No. XXXV was washed with hydrochloric acid. † The artificial carbonate of lime of Ex
contained also magnetic oxide of iron owing to the mode of calcination employed. ‡ In Experiment No. XXXI, t
reported in this table; it has no number in the text with Experiment No. XXXVII; it gave a stem of 70 centimetres,
but with all the other sustances of Experiment No. XXXVII.

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Silicate of potassa and alumina.	Felspar of Baveno.	Argil of Almaroden.	Zeolite	Aluminate of potassa.	Hydrate of alumina.	Powdered bones.	Nitrate of ammonia.	Nitric acid.	Length of the stems in centimetres.	Color of the leaves.	Flower-.	Fruits.	Lateral Shoots.
..	..	..	..	,,	..	..	..	..	32	Green	2	1	..
..	..	..	..	,,	..	..	0,038	..	56 lying down	Green	3	2	..
..	..	..	..	,,	..	..	0,038	..	4	Pale green	..	..	1
..	..	..	..	,,	..	..	..	..	32	Green	1	..	1
..	..	..	..	,,	..	..	0,028	..	,,	Green	..	..	..
..	..	..	..	,,	..	..	0,028	..	,,	Green	..	..	..
..	..	..	..	,,	..	..	0,028	..	40 lying down	Yellowish green	2 incomplete.	..	3
..	..	..	..	,,	..	..	0,028	..	22	Pale green	1	..	..
..	..	..	..	,,	..	..	0,028	..	8	Green	..	..	..
..	..	..	..	,,	..	..	0,028	..	51	Pale green	2	..	1
..	..	..	..	,,	..	..	0,028	..	4	Green	..	..	1
..	..	..	..	,,	..	..	0,04	..	20	Pale yellow	..	..	..
..	..	..	..	,,	..	..	0,02	..	35 lying down	Pale green	3	1	..
..	..	..	..	,,	..	..	..	0,0035	41 lying down	Pale green	1	1	..
..	..	..	..	,,	..	0,2	..	..	8	Pale & dying	..	..	1
..	..	..	..	,,	..	0,2	..	..	35	Green	1	..	2
..	..	..	..	,,	..	..	0,016	..	38	Green	3	..	2
..	..	..	..	,,	..	..	0,04	..	49	Green	6	..	2
..	..	..	..	,,	..	..	0,04	..	50	Green	5	..	2
..	..	..	..	,,	..	..	0,038	..	50	Green	5	..	2
..	..	..	..	,,	..	..	0,028	..	42	Yellowish pale	4	..	2
..	..	..	..	,,	..	..	0,05	..	66	Green at the end	9 incomplete.	..	2
..	..	..	..	,,	0,03	..	0,038	..	16	,,	1	..	Comencement.
..	..	..	..	0,0004 alumina	..	..	0,038	..	46 very languishing	Pale green	3	..	..
..	..	..	..	0,0004 alumina	..	..	0,038	..	56	Fine green	7	..	2
..	..	..	..	0,0003 alumina	..	..	0,028	..	43	Green	3	1	2
..	..	..	..	,,	0,045	..	0,038	..	51	Yellow with green	6	..	1
..	..	..	..	,,	0,05	..	0,038	..	55	Green	7	2	2
..	..	0,3	..	,,	..	..	0,038	..	63	Green	8	5	2 commences
..	0,29	..	..	,,	..	..	0,04	..	43	Pale green	5	..	1
..	0,2	..	..	,,	..	..	0,05	..	38	Pale green	4	2	2
0,13	..	..	..	,,	..	..	0,038	..	70	Green	6	2	3
..	..	..	0,2	,,	..	..	0,038	..	46	Green with stripes	9	..	3
..	..	..	..	,,	..	..	0,02	..	72	Green	9	8	..
..	..	..	..	,,	..	..	0,038	..	61	Green	8	6	..
..	..	..	..	,,	..	..	0,038	..	76	Green	11	9	..
..	..	..	..	,,	..	..	0,05	..	49	Green with stains	6 incomplete.	..	3
..	..	..	..	,,	..	..	0,05	..	60	Green	10	9	3 (1 bearing 3 flowers & 5 fruits)
..	..	..	..	,,	..	..	0,05	..	8	Pale green	..	..	3
..	..	..	..	,,	..	..	0,05	..	19	Green	4	4	..
..	..	..	..	,,	..	..	0,03	..	8	Pale green	..	..	..
0,1	..	..	..	,,	..	..	0,038	..	35	Abnormal	..	..	3
fruits.				,,	..	..	0,03	..	,,	Death at the third leaf	..	..	2
..	..	..	..	,,	..	..	0,05	..	54 lying down	Pale	3 incom.	..	..
..	..	..	..	,,	..	..	0,03	..	30	Pale	2	1	..
..	..	..	..	,,	..	..	0,05	..	24	Pale	2	1	2 (1 bearing 3 flowers no fruits. 1 bearing 4 flowers 2 fruits)
									62	Green	9	..	

‡ No. XL was precipitated with carbonate of ammonia and was not calcined. ‡ The sand of Experiment No. XXXVI bore six fruits, but only two were capable of germinating. ‖ The counter-proof of Experiment No. XXXVII is not eight flowers, six fruits, without lateral shoot; it was made without chloride of potassium and without carbonate of soda,

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NOTE ON THE ABSORPTION OF THE SOLUBLE ULMATES BY PLANTS.

BY M. J. MAAGUTI.

M. SOUBEIRAN has demonstrated the absorption of the alkaline ulmates during vegetation, by two experiments. (See THE CHEMIST, New Series, Vol. i. 1849-50, pp. 452, 543.

FIRST EXPERIMENT.

A plant of Lampsana, whose roots were immersed in a solution of ulmate of ammonia, continued to vegetate and to prosper. The solution, which was changed every day, was partially decolored.

SECOND EXPERIMENT.

Haricots and oats passed very well through all the stages of vegetation in a soil deprived of organic matters, and containing a little sulphate and phosphate of lime, and which was watered from time to time with ulmate of ammonia.

Those who do not believe in the absorption of humus will accept with difficulty results obtained with a plant (Lampsana) which was found in an abnormal state. They will add that there is nothing to prove that the haricots and oats accomplished their vegetation under the influence of ulmate of ammonia, since in the soil it must find phosphate and sulphate of that base. Indeed, if we put sulphate of lime, or powdered calcined bones (or more properly artificial tribasic phosphate of lime), in contact with ulmate of ammonia, ulmate of lime is formed, and, at the same time, sulphate and phosphate of ammonia; and again, when we put phosphate and sulphate of ammonia in contact with ulmate of lime, a double decomposition ensues. In all cases there is a division, and four salts are formed.

I have thought of completing the demonstration of M. Soubeiran, by making an experiment with the aid of the balance.

I half filled two large funnels with gravel, and the other half with powdered brick, containing one per cent. of calcined bones, and as much chalk. I sowed in these two artificial soils, moistened with distilled water, the same quantity of cress seed. During the germination I prepared, by means of turf, perfectly neutral ulmate of ammonia, which I divided into two equal lots, each about two quarts. One of these was set aside, and the other was kept for watering the two soils.

The seeds having sprung up four days after they were sown, I began to water them every day, one with 100 cubic centimetres of distilled water, and the other with the like quantity of ulmate of ammonia. After five waterings, the difference between the two vegetations was very evident. That which had been watered with the ulmate was of a deep green; the other, which had been treated with water, was of a light green.

After eighteen waterings, that is to say, after the experiment had lasted twenty-two days, the most luxuriant plant threatening to fall, I cut it down. For this purpose, I removed horizontally from each funnel a thick layer of soil, which I deposited in a wire sieve with large meshes, dipping in distilled water. The earth was very soon moistened, passed through the sieve, and the plants were separated wtth their roots.

The two crops dried in the air, and in the same circumstances weighed, that watered with water, 12·550gr.; that watered with the ulmate of ammonia, 15·150gr.

The soil impregnated with the ulmate was washed until the water passed out limpid and colorless; afterwards dilute hydrochloric acid was added, and as the water which dropped from the funnel indicated an acid reaction, the funnel was corked again; after twenty-four hours, it was uncorked, and the washing was recommenced, and continued until the water became neutral.

The treatment by hydrochloric acid was succeeded by treatment with ammoniacal water. The latter left the funnel at first very black, and afterwards it became colorless. The two treatments were alternated, until it was quite certain that the soil did not retain a trace of ulmic acid.

All the waters colored by ulmate of ammonia were combined with the rest of the lot employed. The latter was brought to the state of neutrality, and to the bulk of two quarts.

Equal quantities of chloride of calcium in solution were then added to the two lots; two precipitates were formed, which were separately thrown on two filters made with the same paper, and brought to the same weight. The two precipitates were carefully washed and dried, first in the open air, and then in the vacuum of the pneumatic machine; finally, they were weighed with the same balance which had been used for weighing the two empty filters.

The ulmate of lime resulting from the liquid, which had been kept as a point of comparison, weighed 2·600gr. more than the other ulmate.

grammes.

Ulmate of lime of the portion retained..5·700
Ulmate of lime of the experiment.....3·100

Now, 0·590gr. of this salt produced

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0·130gr. sulphate of lime=0·053 of lime.

Consequently, the ulmate of ammonia used for watering the cress lost 2·367gr. of ulmic acid, as it was found in the ulmate of lime dried in vacuo.

It might be supposed that the ulmic acid might have remained in the soil, under an unknown form, which might escape the action of the reagents; but this transformation could not be the result of the contact of the ulmic acid either with the earthy matters, or with the external parts of the roots. Now, this is a question of proving that this acid is absorbed, and not of saying what it becomes after the absorption.

This experiment, and those of M. Soubeiran, seem to me to demonstrate the absorption of the soluble ulmates during vegetation, and at the same time their utility.—*Comptes Rendus*, No. 3, January 19, 1852.

ON PICRIC ACID CONSIDERED AS YELLOW COLORING MATTER.

BY M. J. GIRARDIN.

M. GUINON, a very skilful dyer of Lyon, first conceived the idea of turning to account, for the dyeing of silk, the property which picric acid possesses of staining the skin of a very solid yellow color. His experiments succeeded, and, since July, 1847, he has made great use of this artificial acid for dyeing silk light and medium yellow colors, from sulphur tint to light citron. We admired, in the Exposition of 1849, the tissues died by him with this new tinctorial agent. He has since published a note on the preparation of this acid, and its application to dyeing yellow.*

Picric acid, the discovery of which Berzelius attributes to Hausmann in 1788, is nothing but the yellow and bitter acid product which is formed in the reaction of nitric acid on a great number of organic substances, whether containing nitrogen or not, such as, among others, silk, aloes, indigo, salicine, hydroguret of salicine, coumarine, oil of tar, oil of pit coal, &c. It has been successively known in science under the name of *bitter yellow*, *Welter's bitter*, *indigo bitter*, *maximum bitter* (Chevreul), *bitter acid*, *carbazotic acid* (Liebig), *nitro-picric acid* (Berzelius), *nitro-phenilic acid* (Laurent), *trinitrophenic acid*, and *trinitric phenate* (Gerhardt). M. Thénard gave it the name of *picric acid*, on account of its very bitter taste.

M. M. Dumas and Laurent represent it by the crude formula:—$C^{24}H^6N^6O^{14}$.*

The least expensive process of obtaining it in the large way is that which M. Laurent published in 1841, and which consists in making 12 parts of ordinary nitric acid react on 10 parts of oil of tar, pit-coal, or hydrate of phenyle.† The following is the process by which M. Guinon makes this product for use in his manufactory:—

"Into an earthen capsule or pan, which should be at least three times the size of the bulk of the matters employed, are first put 3 parts of nitric acid of commerce of 36°, the temperature of which is raised to 140°F.; the vessel is removed from the fire, and, by means of an earthenware tube, tapered at its lower extremity, which is dipped into the acid, 1 part of oil of pit-coal is poured in by degrees. Each addition of oil which passes in to the hot acid immediately produces a brisk reaction, causing the mass to heat, and a disengagement, with effervescence, of carbonic acid and binoxide of nitrogen.

"When the liquid threatens to run over the addition of the oil is stopped, and it is cooled by the addition of a little cold acid. When all the oil intended to be employed has been added, the greater part is already converted into picric acid; but much of it still remains in an intermediate state, under the form of a reddish, resinous matter. In order to complete the transformation as much as possible, three new portions of nitric acid are added, the liquor is boiled, and is evaporated to a syrupy consistence, taking care not to allow the matter to dry; without this precaution, it would inflame and burn with intensity.

"Picric acid may also be prepared by effecting without heat the mixture of 1 part of oil of pit-coal with two parts of nitric acid. Heat is then produced, and carbonic acid and binoxide of nitrogen are disengaged; but the effervescence is less brisk than in the former case. Little nitrous gas is produced, and a resinous, glutinous matter is thus obtained, which must be treated hot with nitric acid, and evaporated as above.

"The syrupy liquid obtained in these two cases becomes, by cooling, a pasty, yellowish mass, whose weight is about one-sixth of the matters employed. It is composed of picric acid, a little resinous matter, and

* *Annales de la Société d'Agriculture, d'Histoire Naturelle et des Arts Utiles de Lyon.* 1849, 2e Serie, t. i. p. 178.

* Dumas.—*Quatrième Memoire sur les Types Chimiques. Annales de Chimie et de Physique*, 3e Serie, t. ii. p. 228. Laurent.—*Memoire sur le phenyle et ses dérivés. Ibid*, t. iii. p. 223.

† Laurent.—*Ibid*, pp. 213 and 221.

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nitric acid. The picric acid is separated by boiling the mass in water, which dissolves it, and afterwards leaves it, by cooling, in the crystallised state. Two or three crystallisations give it nearly pure; but to arrive at chemical purity, it must be combined with a base, as ammonia, and precipitated with an acid (nitric or hydrochloric), and then crystallised. After these preparations, the picric acid is under the form of transparent crystals of a light citron yellow.

"For dyeing purposes, it is not necessary to push the operation so far, absolute purity not being necessary. We may limit ourselves to the following operation:—When the pasty mass is obtained, as we have said, it is washed in cold water, to remove the excess of nitric acid, and the residue is afterwards dissolved in boiling water, to which sulphuric acid is added (100 grammes, in a hectolitre of water) in order to separate the resinous matter which accompanies the picric acid. The presence of this matter would give to the silk a disagreeable odor, and would tarnish the color, leaving it a disagreeable reddish tint. A solution of sufficiently pure picric acid is thus obtained, which, diluted with a quantity of water proportionate to the tint desired, may be immediately used for dyeing purposes. It does not require any other medium or agent for favoring the combination of the coloring matter with the silk. It is necessary to operate at the temperature of 86 to 104°F., in order that the combination may be made equally. On leaving the bath, the silks dyed with picric acid must be dried without washing."*

The following is the cause of my being led to study this new coloring agent in an industrial point of view. I received, on the 20th of October, 1850, the following from a Mons. Junoine, of Paris:—

"Sir,

"In your treatise on the dyeing of silk, wool, and cotton,† you say that M. Guinon, of Lyon, employs for obtaining light yellow colors on silk, picric acid in the form of crystals. I wished to assure myself of this fact, and I asked, through one of my friends, for a sample, with price. M. Guinon replied, through one of his correspondents in Paris, that he did not make crystals; that he employed for dyeing silk yellow a coloring liquid which he made from coal tar; that he sold this product at 20 francs (16*s.*) the litre (quart); and that he could not undertake to supply picric acid in crystals, on account of the difficulty of obtaining them.

"I have found the means of furnishing to commerce a large quantity, and at a price which will admit of its employment.

"I have the honor to send you a sample of our crystals, and beg you, in the interest of science and commerce, to devote some of your valuable time to the examination of this product. Your opinion would be of importance to me before entering into the commerce of my discovery.

"The liquid of M. Guinon contains fatty and oily matters which require, on the part of those who employ it, expenses of hand labor and preparation, which greatly increase the cost. A dyer of Paris, who has used M. Guinon's liquid, has been kind enough to try my crystals, and appears satisfied as regards both the shade and the simplicity of employment.

"I have the honor, &c.

"LEMOINE."

"22, Rue de Varenne."

According to the desire expressed in this letter, I employed the picric acid sent to me for dying silk, wool, and cotton. I obtained the following results:—

1. Silk very rapidly takes in the aqueous solution of this acid, maintained at 86 to 104° F., a beautiful straw yellow tint. It required 6·84 grammes of crystallised acid to dye of this tint 1 kilogr. of silk.

But this silk, thus dyed without the assistance of any mordant, left a great part of the coloring matter in the water employed for washing.

By previously mordanting the silk with a mixture of alum and cream of tartar, the picric acid was fixed with much more solidity, and then the dyed silk might be washed several times. But, in all cases, the color does not resist the action of weak acids and alkalis, and weak chloride of lime. It bears the action of the air and the sun very well.

2. Wool acts like silk, except that it takes a more intense tint, and is colored of a fine citron yellow.

It requires only 3·73 grammes of picric acid for giving this tint to 1 kilogramme of wool.

The color resists washing only when the wool has been mordanted with alum and cream of tartar.

The tint is not affected by the air and

* Guinon.—*Loc. citat.*

† Traité 84 of "*Instruction pour le Peuple, ou Ceut Traités sur les Connaissances les plus Indispensables.* — Paris, Paulin et Lechevallier, 1850.

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the sun, but does not bear the action of chemical agents.

3. Cotton, whether mordanted or not, does not take any color in the picric acid bath.

From the numerous experiments which I have made, it results :—

1. That picric acid is a very rich coloring matter for silk and wool.

2. That beautiful yellow tints may be given to these tissues, without at all injuring their suppleness, and by operations which are as simple as possible.

3. That for these dyed tissues to be capable of bearing washing with water, they must previously be mordanted with alum and cream of tartar.

4. That goods dyed with picric acid resist well the action of the air and the sun, but do not support the action of chemical agents,—acids, alkalis, and the bleaching hypochlorites.

5. That picric acid is not therefore a very fast coloring matter.

6. Nevertheless, that it is a substance which must render very great service in the dyeing of silk and wool, especially, if its price be not too high.

7. That, at all events, it cannot be used for dyeing cotton and other vegetable textiles.

8. I may add, in conclusion, that M. Lemoine sells picric acid in crystals at 25 francs (£1.) the kilogr.

At this price, the dyeing of 1 kilogr of silk would cost 1 franc, 72 centime (about 1*s.* 5*d.*); and that of 1 kilogr of wool, 93 centimes (about 9*d.*)—*Journa de Pharmacie et de Chimie*, January, 1852.

ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.*

Improvements in writing, printing, or marking letters, characters or figures upon paper, parchment, or other materials properly prepared for that purpose. HENRY CRAVEN BAILDON, of Edinburgh, chemist. Patent dated July 7, 1851.

The object of this invention is to guard against the falsification of banker's cheques, letters of credit, and other similar documents; and for this purpose the patentee makes use of colored paper, and produces letters or marks thereon by means of a chemical fluid capable of discharging or changing the color of the paper or other material to which it may be employed. In order to afford additional security, the patentee prefers to use, for preparing his paper, a compound color, such as purple or green, which may be made, the purple with Prussian blue and an animal, mineral, or vegetable red, and the green with Prussian blue and chromate of lead. The fluids employed for marking or writing are solutions of potash (liquor potassæ) and of soda, both of which are capable of discharging colours produced as above-mentioned. Some of the paper sold by stationers is colored with Prussian blue, and such paper may be also used for the purposes of the invention; and if paper be prepared with iron, a solution of ferrocyanide of potassium, with a small quantity of muriatic acid, will be suitable for writing thereon. The different coloring matters employed in the preparation of paper may be mixed with the pulp in the course of manufacture, or the paper may be prepared by immersion in the different solutions, and then dried, and if necessary, pressed. Parchment is prepared by immersing it, when strained on a board or frame to prevent warping, in coloring solutions; and if a green colour is desired, it may be obtained by the use of Prussian blue and solution of fustic.

When printing with alkaline solutions on paper prepared by the above-mentioned processes, the types are to be slightly oiled on the sides to prevent the solution running, and a gutta-percha covered roller is employed for distributing the solution over the type. Instead of using solutions for discharging the color from tinted paper, colored solutions may also be used, so as to vary the color of the parts of the paper to which they are applied; and if desired, portions of documents may be printed or written by the means above mentioned, and other portions printed or written with common printing or writing inks.

Claims.—1. The mode of writing, printing, or marking the letters, characters, or figures of documents upon colored paper, parchment, or other proper material, by means of such a chemical fluid or mixture, as will discharge or change the color of those parts of the paper, or other material so written or printed on or marked.

2. The mode of writing, printing, or marking the letters, characters, or figures of documents upon colored paper, parchment, or other proper material, by means of such a chemical fluid or mixture as aforesaid, such fluid or mixture being also colored or tinted, so as to color or vary the color of those parts of the paper or other material to which it may be applied.

* Collected from the *Mechanic's Mag.*

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3. The writing, printing, or marking a portion or portions of the letters, characters, or figures of documents upon colored paper, parchment, or other proper material, by means of such a chemical fluid or mixture as aforesaid; and also writing, printing, or marking another portion or other portions of such letters, characters, or figures, in any ordinary manner, with writing ink or printing ink.

Improvements in the preparation of gutta percha and caoutchouc, and in the application thereof. STEPHEN MOULTON, of Bradford, Wilts, India-rubber manufacturer. Patent dated August 14, 1851.

It is well known to persons acquainted with native gutta percha, that this gum is extremely liable to be affected by changes of temperature, that it becomes rigid under a low, and soft under a moderately high temperature, and, moreover, that it is almost destitute of elasticity. These disadvantages prevent its application to many useful purposes for which it is otherwise adapted. Now the patentee obviates these disadvantages by combining with the native gutta percha, either alone or mixed with a certain proportion of caoutchouc, a mixture of hyposulphite or sulphite of lead or zinc with artificial sulphuret of lead or zinc, and submitting the same to the action of a high degree of temperature, thereby produces a new compound, which he calls cured gutta percha, and which remains unaffected by change of temperature, possesses a considerable amount of elasticity, and resists the action of solvents of the gum in its native state.

The process adopted in the treatment of gutta percha is as follows:—The patentee takes one pound thereof, or as much more as can be conveniently ground or worked, and having cleansed it from impurities, he adds to the same from two ounces to half a pound of hyposulphite of lead or zinc and artificial sulphuret of lead or zinc, in about equal proportions of each, with from two to twelve ounces of Paris white or chalk, in a powdered state. These ingredients are then mixed together, and ground between heated rollers, and otherwise treated in the manner directed in the specification of a patent granted to Mr. Moulton, Feb. 8th, 1847.

When the gutta percha is combined with caoutchouc (which may be done in equal proportions, or in any other desired proportions), the process is conducted in the same manner; the quantity of hyposulphite of lead or zinc and artificial sulphuret of lead employed in this case, is from two to six ounces, and of Paris white or powdered chalk, two to twelve ounces for every pound of gutta percha and caoutchouc mixture. This composition possesses more elasticity than the cured gutta percha, but is not so well calculated to resist the action of oils.

To produce a hard cured gutta percha or gutta percha and caoutchouc composition, the patentee adds to every pound thereof from two to twelve ounces of calcined magnesia, but conducts the process, in other respects, exactly as if the magnesia had not been used.

The compositions above mentioned having been manufactured into sheets or moulded articles, are finally submitted to the action of steam or dry heat of from 250° to 350° Fahr. in a closed room or vessel. The time occupied in this curing process varies from two to ten hours, according to the size and thickness of the articles treated.

Claims.—1. The use in combination with gutta percha alone, or with gutta percha and caoutchouc, of the acids of sulphur of a lower degree of oxygenation than sulphuric acid in combination with suitable bases, but the use by preference of a hyposulphite, which can be used alone or in combination with the salts of the acids of sulphur, or with the sulphurets.

2. The use of the artificial sulphurets of lead or zinc in combination with Paris white or chalk, used with the gutta percha alone, or gutta percha and caoutchouc, or with a salt of a lower degree of oxygenation than a sulphate and artificial sulphuret of lead or zinc.

3. The treating of gutta percha either alone or with caoutchouc by combining therewith calcined magnesia, or carbonate of magnesia and hyposulphite of lead or zinc, and the artificial sulphuret of lead or zinc, and subjecting it to a high degree of temperature.

For improvements in the manufacture of phosphorus, and in the apparatus to be used therein. ARTHUR ALBRIGHT, of Birmingham, manufacturing chemist. (A communication.) Patent dated July 17, 1851.

This invention consists of an improved method of treating phosphorus, whereby it is rendered amorphous and non crystalline, and so far modified in its general character as to be capable of being readily removed from place to place without danger. It is also changed in color, and deprived of much of its poisonous nature and offensive smell, and does not ignite under friction or percussion, unless the heat generated thereby exceeds 464° Fahr., the point at which the amorphous phosphorus is inflammable being

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482° Fahr.; neither is it so liable as ordinary phosphorus to become converted to phosphoric acid when exposed to the influence of a warm temperature; but when mixed with chlorate of potash, it becomes highly inflammable, and may then be used for the manufacture of lucifers and other similar articles.

These results are produced by the application of heat to ordinary manufactured phosphorus while access of air is prevented.

The phosphorus to be operated on is placed in a glass or porcelain vessel, inside a closed cast iron pot, which has a pipe communicating with a vessel containing quicksilver and water, or water only. The cast iron pot is placed in a sand bath, which again is placed in a metallic bath, to which is applied the heat necessary for conducting the operation. The application of moderate heat causes bubbles to escape from the pipe of the vessel containing the phosphorus, which ignite on coming in contact with the air; as soon as these bubbles have ceased to issue from the pipe, the temperature is raised to about 500° Fahr., and maintained at that point until the phosphorus is rendered amorphous. It is then lowered, and the phosphorus allowed to cool, when it is levigated under water, and strained or pressed in filter bags. When dry, it is purified by spreading it in thin layers on iron or lead plates, and applying heat, which may be that of steam. In order to remove any ordinary phosphorus which has not been converted to an amorphous condition, and which adheres to that which has been operated on, the phosphorus is washed in water, or its removal may be effected by the use of bisulphuret of carbon.

Claim.—The manufacture of an improved or amorphous phosphorus, and the apparatus employed in such manufacture.

For improvements in ornamenting paper and other fabrics. JOSEPH MANSELL, of Red Lion-square, manufacturing fancy stationer. Patent dated July 31, 1851.

These improvements consist in producing ornamental patterns or designs upon paper and other fabrics, which are capable of being glazed or glossed by pressure, by removing certain portions of the glaze, or glazing certain portions only of the surface, thus producing a finish which, from its resemblance to woven damask, the patentee calls "satin damask" finish.

When operating on glossed or glazed paper, or woven fabrics, the patentee employs a stencil plate, having a design or pattern cut in it, which he places on the surface of the paper or fabric, and then applies a blanket moistened with water, which, by coming in contact with the glazed portions of the fabric left uncovered by the stencil plate, removes the gloss therefrom, and produces a dull or deadened pattern, which contracts strongly with the glazed ground of the fabric. The same effect may be produced by using an engraved block similar to those employed in color printing, to apply moisture to those portions of the surface of the fabric from which the gloss is required to be removed in order to produce the design or pattern.

When the pattern is to be produced by partially glazing the surface of a fabric, steel plates or rollers are employed, portions of the surface of which have been deadened or rendered dull by dilute acid, stopping out those portions of the surface which are required to be left bright. The fabric to be ornamented is submitted to pressure between the prepared roller or plate, and another roller composed of yielding material, by which a design or pattern is produced on the fabric corresponding to that of the deadened portions of the surface of the plate or roller.

Claims.—1. Producing upon the class of fabrics already designated ornamental, designs or patterns, by partially removing the glaze or gloss which such fabrics have received.

2. Partially glazing or glossing paper and other fabrics that are capable of receiving a gloss by pressure, so as to produce thereon ornamental designs or patterns by contrast of the dull and glazed portions of the surfaces of the fabrics so treated.

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PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

POISONING BY PHOSPHORUS.

BY M. E. COTTEREAU.

(*Concluded from page* 234.)

AFTER making these observations, it is necessary to examine whether normal phosphorus does not exist in the stomach, intestines, or vomited matters in some form or other. The properties of this body are so limited, that it is not possible to confound it with any other substance. Besides, when heated with weak nitric acid, it is by degrees transformed into phosphoric acid, which is readily recognised by its peculiar characters. If any be found, it is to be washed in distilled water, it is then fused in a tube containing water; the tube is then hermetically sealed, and this phosphorus is preserved as a matter of evidence.

In the cases when no trace of normal phosphorus can be found, it is necessary to collect the solid and fluid matters of the stomach and intestinal canal, and the matters vomited, so as to ascertain if any of these remains do not contain divided phosphorus,* or the acids of phosphorus produced by the combustion developed in the organs. For this purpose, the following is the process to be employed.

The substances contained in the stomach and intestines, and the vomitted matters, are passed through a cloth; a *liquid* and a *solid* part are thus obtained.

1st, The *liquid portion* may contain phosphorus, or phosphoric or phosphorous acids, or a mixture of these two acids. After having, with a portion of the liquid, sought to determine the characters of the aqueous phosphorised solution, and those of the phosphoric and phosphorous acids, which we have already given,* the rest of the liquor is to be boiled with nitric acid, or it may be subjected to the prolonged action of a current of chlorine gas. To whatever treatment the liquor may be subjected, phosphorus or phosphorous acid, or both, are found transformed into phophoric acid, of which the presence may be ascertained in the residue after evaporation.

2nd, As to the *solid part*, it is divided so as to subject it to the operations which we are about to describe. One portion is placed with the linen in which it has been collected on an iron plate, which is slowly and moderately heated; it is then examined to see if it produces white vapors, or if it manifests luminous points of combustion. It is best to try this experiment in the dark.

Another portion is introduced into a flask with eight or ten times its weight of sulphuric ether, which dissolves the fatty matters and the phosphorus, if it finds any. These two substances thus form the residue of evaporation of the etherised liquid; and by the application of a greater heat, the residue burns with a very brilliant yellowish flame, diffusing a very acid white smoke; the charcoal proceeding from the combustion is very acid, and yields phosphoric acid to water, as is evident from its characters.

Another portion washed with fifteen times its weight of distilled water is subjected to the action of a current of chlorine gas. By contact with this gas, the phosphorus is converted into phosphoric acid, which is found in the residue of the evaporation of the chloruretted liquid.

Finally, it is unnecessary to say that these operations may be repeated on the different liquids and other organs, besides those of which we have spoken, and that the phosphorus may be isolated from the phosphoric acid obtained in these various operations by the calcination, at a high temperature, of the mixture of this acid with charcoal and boracic or silicic acid.

Having showed the processes which should be employed to prove poisoning by phosphorus, we will now speak of the circumstances which have led to the debates relative to *normal phosphorus*.

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* The experiments made in Germany, and those of M. Lassaigne, have proved that it is always important, in the case of suspicion of poisoning with phosphorus, or phosphorised preparations, to examine the dejections for the presence of *normal* phosphorus, even after a prolonged exposure to the air.

* Besides the characters which we have indicated, we must mention here that the phosphate obtained by the addition of the solution of phosphoric acid to lime water gives, after having been dried and treated with heat, by an excess of potassium, in a glass tube closed at one end, a residue which, thrown into water, produces a disengagement of phosphuretted hydrogen gas very easy of recognition. This process, proposed by M. M. Vauquelin and Thénard, is of such great delicacy, that it will detect the presence of *a demi-milligramme* of phosphate of lime.

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(Here follows the case of M. V——, for which see THE CHEMIST for October 1851, page 46.)

M. M. Boudant, Trapenard, and Lefort, were judicially charged to examine the remains of V——, to make what investigations they thought proper, and to draw up a report accordingly. The following is the result of their observations:—

Post Mortem Examination.—No external traces of violence, the countenance calm, the members stiff and contracted, a little mucosity in the meatus urinarius, the mucous membrane of the mouth red and inflamed; the coloration of the external surface of the stomach and intestines showed great inflammation of these organs. The liquids of the stomach were collected; its mucous membrane, crimsoned and inflamed almost all over, and softened in some parts, presented, not far from the pylorus, an ulceration of nearly three centimetres in diameter, the edges of which were swelled and brownish, and showing the muscular membrane uncovered. A second smaller ulceration, more to the left, and offering in all respects the same characters, was remarked. The mucous membrane of the whole of the small intestine showed traces of most acute inflammation. Honey-comb shaped swellings were here and there perceptible, with swelling and hypertrophy of the connivent valves, but neither excoriation nor softening. The colon was exempt from all vestiges of inflammation which re-appeared at the rectum, becoming more numerous as they approached the anus.

Nothing particular was observable in the liver, kidneys, spleen, pancreas, lungs, or bronchial tubes: the bladder was empty, contracted, and presented here and there a slight hyperemic and not inflammatory injection of its mucous membrane. The left ventricle of the heart was in a considerable state of hypertrophy. The internal membrane of the right auriculo-ventricular valves of the heart was evidently softened, and easily detached by pressure.

Chemical Analysis.—The reagents being previously tested and found pure, experiments were made on a portion of the liver, a portion of the stomach, and the liquids of this latter organ. 150 grammes of the liver were placed in a porcelain capsule with 200 grammes of very concentrated nitric acid; it was boiled to drive off as much of the acid as possible; the matter reduced to a fourth of its volume, and washed with distilled water, was filtered, and subjected to the following reagents:—

Sulphuretted hydrogen, no reaction; nitrate of silver, very light yellow precipitate; sulphate of magnesia; white precipitate, soluble in an excess of acid. Introduced into Marsh's apparatus; no arsenical stains.

60 grammes of the stomach, treated in the same manner, gave exactly the same results. The liquids contained in the stomach, weighing nearly 45 grammes, subjected to the same reagents, gave the same characters, only that it was proved that the precipitates obtained from the stomach were more abundant than those from the liver, and these again were more abundant than those from the liquids of the stomach.

The presence of phosphorus, or of phosphoric acid, was evident; but to leave no doubt, the phosphorus was isolated from a portion of the stomach by the ordinary means. 200 grammes of this organ, treated by 400 grammes of nitric acid, were evaporated to dryness, then treated by distilled water, filtered, and subjected to a new and complete evaporation. The residue mixed with eight times its volume of wood charcoal, and subjected to a high temperature, exposed phosphorus with all its properties.

CONCLUSION.—The chemists concluded that the liver, the stomach, and the liquids found in this organ, contained phosphorus in a sufficient quantity to produce death, and that to this cause should be attributed the anatomo-pathological lesions which they described.

REMARKS.—1st, Setting on one side the anatomo-pathological lesions which are characteristic of poisoning by phosphorus, and whilst regretting that no means were taken during life to prove the marks of the excitation of the genital organs, we are surprised to find in the report of the chemists, and contrary to what they advance, but one single characteristic of the presence of phosphorus, and again this characteristic is not that which results from the extraction of natural phosphorus, of which it would be well to determine the ponderal quantity. In fact, if we observe that *phosphoric acid*, as we have said above, *does not precipitate nitrate of silver*, if we remark that it *gives no precipitate with sulphate of magnesia*, we have some difficulty in understanding the reasons which have led these gentlemen to say that "the presence of phosphorus or phosphoric acid was evident" from these characteristics, which are truly those of phosphoric acid, but after this acid has formed a saline combination, and *has been saturated by a small quantity of soda or potassa*. Ammonia cannot be used in this saturation, because the salts of silver are soluble in ammonia, and even in ammo-

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niacal salts; it would then follow, that in operating the saturation of the acid with this alkali, there would be a risk of not finding the phosphoric acid again.

2nd, In discussing the facts contained in the report of these chemists, one of them, M. Lefort, has explained that if he concurred with his colleagues as to death having been caused by the phosphorus found in considerable quantities in the organs of V——, it was because he knew at first that the victim had employed this means for his destruction; not that he has the least doubt as to the experiments made, or the great quantity of combined phosphorus which was discovered, but it being impossible to find phosphorus in a free state in the economy, because in this condition, according to the Piedmontese physician, Giulio, it passes rapidly into the state of acid on the one hand, and on the other all the organs of man containing phosphorus variously combined, he considered that the question whether the phosphorus found is normal phosphorus or swallowed, is a most difficult one to decide. For his part, he would not accept the responsibility of answering in a court of justice. M. Lefort insists all the more on this opinion, as the quantities of normal phorphorus are undetermined, as they vary according to the individual and the complaint, and as these morbid variations might possibly give rise to phenomena similar to those observed in the case of V——; to sum up, that he has always been convinced that, scientifically, a chemist can never affirm in a court of justice that a case of poisoning by phosphorus had occurred.

With all respect to the opinion of M. Lefort, an opinion, moreover, which has been strongly combated by several members of the Society, and among others by Drs. Choisy, Laronde, Trapenard, and Boudant, we may be permitted to make some observations on this subject.

In the first place, we cannot refuse to admit that there exists no morbid affection in which phosphoric acid is set free and disengaged from the salts in which it forms part of the economy, and that the cause of the softening of the bones is not yet perfectly known; however, one of the most probable hypotheses is that which attributes softening of the bones to the developement of certain peculiar organic acids possessing a dissolving power with regard to the inorganic matter of the bone, which consists, as is known, in a great measure, of calcareous phosphate, which is then expelled by the urinary secretion, as the analysis of the urine of several rickety persons, made by many chemists, has proved. Besides this, phosphoric acid, or an oxygenised compound of phosphorus, cannot exist in a free state in the economy, unless when introduced.

In the second place, M. Lefort appears to us to advance a great deal in saying that the quantities of normal phosphorus are undetermined, and that they vary according to the individual and the malady. Indeed, if they are undetermined, how can it be known that they vary?

Although we possess no analysis of the stomach which will enable us to know the chemical composition of this organ, and the quantity of phosphate which it is capable of leaving in the product of its incineration, still we may advance that the whole stomach could not leave in its ashes a sufficient proportion of phosphate to represent the dose of phosphorus which would cause death. Starting from this point, when in an analysis is found phosphoric acid, or phosphorus in any considerable quantity, exceeding 53 milligrammes as the minimum, and 212 milligrammes as the maximum, at which doses the simple body can produce death, as that has been established, it may be admitted that it has been used as a poisonous substance.

However, we must say that analyses made for the purpose of finding the mean quantity of combined phosphorus which exists in each organ, whether in a healthy state or in various maladies, would be of a nature to fix the opinion of scientific men in a more positive manner; and in this respect the experiments which are intended to be made by M. M. Choisy and Lefort, and which have been led to on this occasion by the discussion which took place at one of the sittings of the *Société de Gannat*, will render eminent service to science. However it may be, we believe that in the present state of our knowledge, it is possible for a chemist to find sufficiently numerous elements of conviction, or, at any rate, of strong presumption, to be conclusive as to a poisoning by natural phosphorus.—*Journal de Chimie Médicale*, January 1852.

EXPERIMENTS FOR DETERMININING THE PURITY OF SULPHATE OF QUININE.

BY M. GUIBOURT.

In the course of the year 1850, the medical jury of the *Departement du Nord*, seized four samples of sulphate of quinine which had been sold to the *Pharmacie des hospices de Valenciennes*; the jury proved in it the

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addition of a certain quantity of salicine. This sulphate bore the seal of a manufactory in Paris;* the Ecole de Pharmacie was instructed to remove the samples and to make a chemical examination of them. It resulted from this operation that this sulphate, several flasks of which had been taken by chance from the midst of others, was not only free from salicine, but also that it did not contain the smallest quantity of sulphate of cinchonine. The experiments made on this occasion having presented to us some new facts we shall detail them here.

1. Determination of the quantity of water. 2·5gr. of sulphate from a flask all of whose contents had been well mixed, were dried in a small stove heated to the boiling point of water. The loss was 0·39, corresponding to 15·6 per cent. of water, or 7½ equivalents. This quantity of water is that which is habitually found in the half effloresced sulphate of commerce.

2. This sulphate did not turn red with concentrated sulphuric acid, and did not contain salicine.

3. Concentrated sulphuric acid occasioned a very feeble greenish-yellow coloration, which might lead to the suspicion that it contained a little phloridzin. But as it does not undergo the least coloration when exposed, under a bell-glass, to the vapor of liquid ammonia, it was proved that it did not contain any.

4. This sulphate dissolved very sparingly in cold alcohol of 90 per cent.; but it was *completely and very promptly dissolved in it by the action of a moderate heat.* This experiment shows that the sulphate of quinine contains neither *gum*, nor *fecula*, nor *sulphate of lime*, nor *sugar of milk*, nor even *sugar*.

5. This sulphate was *completely soluble* with heat in water acidulated with sulphuric acid: it contained, therefore, neither *fatty acid* nor sub-resin.

6. Tests by baryta. In order to ascertain if this sulphate of quinine contained sugar, salicine, phloridzine, mannite &c., and to separate one or other of these substances it was recommended to add baryta water to the sulphate dissolved; but whether we operated thus, or triturated for a long time the pulverised sulphate with an excess of baryta water, we were enabled to produce only a sub-sulphate of quinine very soluble in cold water, and possessing, like quinine itself, the singular property of becoming insoluble by the application of heat. To obtain the complete decomposition of the sulphate, it must be heated for half an hour with an excess of baryta water; it is allowed to cool; a current of carbonic acid is passed into the liquor, and it is filtered. It was supposed until these experiments that when pure sulphate of quinine had been used, this liquor should contain nothing; but it contains a very large quantity of quinine, which separates when the water of the water-bath begins to boil. We discovered this fact in acting on the sulphate of quinine submitted to our examination, and we have proved moreover that that the very concentrated liquor deprived of almost all the quinine which it contained presented no indication of sugar, mannite, salicine, or phloridzine. To the last we extracted nothing but quinine which was entirely converted into sulphate, *without* any coloration, by a suitable addition of sulphuric acid.

7. Search for sulphate of cinchonine.

Liebig appears to have recommended for this purpose the following process:—Triturate in a porcelain mortar 1 grammme of sulphate of quinine, with 60 grammes of liquid ammonia; pour the whole into a flask and add to it 60 grammes of sulphuric ether. Agitate several times and leave to repose. The quinine is dissolved in the ether; but the cinchonine, if there be any present, remains insoluble, floating between the two layers of the ethereal and ammoniacal liquids.

This process appeared to us the most simple of all those proposed. However, as, according to the remark of our colleague, M. O. Henry,* cinchonine is not completely insoluble in ether, and as the ammonia employed in such great excess may likewise dissolve a certain quantity of alkaloïd, we made the following modification in it.

2·5gr. of sulphate of quinine resulting from the accurate mixture of the sulphate contained in a flask of 30 grammes, were introduced into a flask with 15 grammes of liquor ammoniæ. After having well agitated the mixture, it was left for twenty-four hours, in order to make sure of the entire decomposition of the sulphate. It was then heated in a water-bath, in order to almost entirely volatilise the excess of ammonia; it was allowed to cool, and 24 grammes of *pure* ether were added. By agitation the quinine was very promptly and completely dissolved, so that the flask presented two transparent liquids, namely, water containing sulphate of ammonia, and ether containing quinine. This experiment, which is of the greatest nicety, proved to us that the sulphate of quinine submitted to

*That of M. Thibouméry and Dubosc.

* *Journal de Pharmacie et de Chimie*, 1849, t. xvi, p. 30.

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our examination contained no sulphate of cinchonine.

To assure ourselves of the value of this process, we repeated it, adding to 2 grammes of pure sulphate of quinine 1 decigr. of sulphate cinchonine. The ether dissolved the quinine as easily as in the foregoing experiment; but there remained an insoluble residue of cinchonine, on the sides of the flask and under the form of a thick layer, between the two liquids. This insoluble residue was so bulky and evident that one fourth or one fifth of the quantity of sulphate of cinchonine added, would easily have been discovered by the same means. It is moreover very easy to obtain cinchonine and to weigh it, by removing the ether by means of a pipette, replacing it with fresh ether, which is again removed, receiving the rest on a small weighed filter, washing the flask and the filter with distilled water &c.

Independently of several full flasks of sulphate of quinine, weighed and bearing the seal of the manufactory, the sulphate in which was found of the greatest purity, as we have stated, the Professors of the Ecole de Pharmacie took a sample of the same salt from a large open bottle used for retailing. This salt was not reddened by concentrated sulphuric acid, and dissolved completely in acidulated water. Treated with boiling alcohol it left an insoluble residue, very inconsiderable, which was sulphate of lime. Treated with ammonia and ether, as above, the quinine was almost instantly dissolved; but there remained (of 2 grammes of sulphate employed) between the two liquids, *a white and opaque layer*, which could only be cinchonine, and the weight of which was very apppreciable with the best balance. There remained, moreover, at the bottom of the aqueous liquid a floculent and greyish deposit of sulphate of lime; but the quantities of the two sulphates of cinchonine and lime indicated by these experiments, were so small that they could not be regarded as the result of a fraudulent addition.—*Journal de Pharmacie*, January, 1852.

CHEMICAL, PHARMACEUTICAL AND THERAPEUTICAL RESEARCHES ON THE OIL AND SEEDS OF CROTON TIGLIUM.

BY M. DUBLANC.

WORKS of great scientific interest have been published concerning the chemical nature of the seeds of the croton tiglium, of the family of the euphorbiaceæ.

After having rapidly analysed these works, M. Dublanc proceeds as follows:—

In the state of uncertainty which still remains, after all these works, the following questions may be asked:—

Does croton oil contain an acid volatile at a low temperature?

Is this acid a principle of its action, and can it be assured if it be kept without the oil, or diminished if allowed to evaporate?

Such is the point of the study to which I have devoted myself, the problem which I have undertaken to elucidate and to solve.

EXTRACTION OF THE OIL.

The croton seeds covered with their envelopes, crushed and subjected to pressure, furnish directly a certain proportion of oil. By treating the residue of this pressure with twice its weight of alcohol, and again pressing, a liquid is extracted, which is a mixture of oil and alcohol. The distillation of this liquid on a sand-bath leaves a new quantity of oil, which is added to the first, and both are filtered after sufficient repose.

The first part of this operation gives the natural oil, in the state in which it exists in the seeds. It is of a light amber color; it is viscid, and of a peculiar odor. It is very acrid, and its application to the skin produces an irritation whose intensity depends on the quantity and the time it remains applied. For example, a single drop acts at the end of two hours.

When blue litmus paper is steeped in this oil, it becomes red, which shows that it is rather acid. The red color acquired by this test paper, although feeble, resists the action of air and heat.

The oil extracted by means of alcohol in the second operation is somewhat more colored, more viscid, and rather more acid than the oil obtained by simple pressure. The blue paper reddened by it retains its redness in the same circumstances.

This process of extraction, which is that of the Codex, gives 25 parts of oil for 100 parts of seeds employed.

One of the foregoing operations has already given rise to a remark on the question of the acidity of croton oil. When the alcohol employed in the second operation is distilled, it is observed that the distilled product is not acid; it has no action on litmus paper. The oil which remains in the still has retained the acid, and gives as evident signs of it as it did before distillation. If the residue of the pressure of the seeds be collected, after having extracted the oil, and if it be treated with water or alcohol, we find no trace of acid in either the water or the alcohol distilled. It is difficult to refuse to acknowledge a certain degree of importance in these phe-

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nomena as regards the existence of a volatile acid in croton oil.

However, the authority which has given rise to this opinion requires more numerous contradictory facts, which we shall endeavor to supply.

Croton oil was extracted by treating the seeds with ether. The ethereal liquor holding the oil in suspension was acid; it was placed in a vessel with two openings. One of the openings was fitted with a straight tube, which went to the bottom of the liquid, and capable of allowing the external air to enter. The other communicated with a series of apparatus.

1. A Liebig's bulbular tube, containing tincture of litmus.

2. A similar tube containing alcohol.

3. An angular tube passing into a large vessel filled with water, to be used by drawing off the liquid from below, for causing air to pass through the thick layer of ether and oil, in order to convey the volatile principles to the liquors destined to retain them.

The apparatus being fitted up, it was set in operation by drawing water from the large vessel. The vacuum having commenced, the air arrives at the bottom of the ethereal liquor, and its passage is kept up until the ether is completely evaporated. The air has then agitated the liquid sufficiently long for carrying away, in the state of vapor in solution, all the ether which the mixture contained. However, the tincture of litmus, opposing the passage of the ethereal vapor and the air, was not reddened, as it would have been if the volatile principle had contained an acid. The alcohol likewise traversed by the current had fixed no body of an acid nature.

The air, saturated with ether, when it arrived in the vessel to replace the water, had no acid property; its action on the eyelids and nostrils caused violent irritation, showing the presence of an acrid, but neutral principle. Another experiment was made with the same apparatus, always having the object of passing a large quantity of air through the croton oil.

This time only, instead of making the air enter into a concentrated solution of the oil in ether, the current was established in pure oil. The reservoir of water was also modified, so that, instead of being entirely filled, an empty space was left in the upper part to receive a sponge soaked in the oil, and another impregnated with ether. Everything being thus arranged, the liquid was set flowing, and the air was drawn through the oil, arriving at the bottom of the layer of oil, leaving by its surface, and causing a prolonged bubbling.

The mass of air employed in this operation was not less than 2 centimetres.

The tincture of litmus of the Liebig's bulb was not reddened. The oil squeezed from the sponge was neither acid, nor acrid, nor corrosive. The ether had entirely left the other sponge, owing to two great a quantity of air having been employed. Must not these two experiments be regarded as conclusive, and must it not be admitted that, if croton oil contained a volatile acid principle, either removed by the ether the first time, or by the air the second time, and obeying its own volatility, it would have quitted its oily solvent, and would have manifested its presence in the bodies, or in the space prepared for its reception? There resulted from these experiments only the presumption of an active volatile principle, but not of a nature to be collected. Facts of another order will lead to the same conclusions.

When, after having crushed the croton seeds, they are distilled with water or alcohol, the distilled products of these operations are not acid. On the contrary, the fixed matter which remains in the retort presents indisputable signs of acidity.

The same phenomenon is observed in the distillation of the alcoholic liquor resulting from the second treatment of the seeds in the extraction of the oil. The alcohol collected is not acid, and the oil which it abandons retains this character.

Croton oil kept for a long time in an oven did not lose its acidity, which was originally very feeble. Its action on the skin seemed to be less vivid than before. Not having been able to disengage the acid principle from its union with the oil, it remained to be seen whether we could not succeed better in concentrating it in one of the parts of the oil itself. Authors say, indeed, that the oil may be separated into two; one insipid, and the other acrid. On this point, the indication exists; but the laconism in which it is expressed is not completely satisfactory.

For the purpose of the experiments relative to this question, the oil was extracted from the seeds by means of ether.—*Gazette des Hôpitaux.*

(*To be concluded in our next.*)

ON CHROMIC ACID AS AN ESCHAROTIC.

BY DR. PROMER.

CHROMIC acid has been, on the recommen-

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dation of Dr. Heller, tried in many cases as an escharotic, in the syphilitic wards and clinique of Professor Sigmund; the results hitherto obtained would justify a further trial of it in cases in which a deeply penetrating, gradual caustic, and one constant in its effect would be indicated. When employed in substance, its action is exceedingly slow and gradual, occupying many hours; nevertheless in intensity it exceeds that of the caustic alkalis. In extremely concentrated solution (to insure saturation, a slight excess of crystals should be allowed to remain undissolved in the fluid) its action is less penetrating and less gradual; but, at the same time, it is more continuous than that of all other known caustics; on the other hand, the more dilute the solution, the more transient and superficial is the effect. The facility with which its action can be thus graduated renders it in all cases a suitable escharotic.

In order to test its action, the first experiments were performed on new growths and marks, viz., on pointed and broad condylomata, occupying the genitals and inner surface of the thighs in different individuals, and varying in thickness from two to eight lines; and in their longest diameter from half an inch to two and a half inches.

MODES OF APPLICATION.

The surrounding parts having been protected by folds of lint, strips of adhesive plaster, &c., the chromic acid in substance (mixed with sufficient water to form a paste) is spread with a spatula on the part to be cauterised, so as to form a layer scarcely a line in thickness, which is covered with lint, kept in its place by adhesive plaster. The concentrated solution is applied by means of a glass rod, a pencil of asbestos, or, if necessary, a hair pencil, (which, if immediately washed, can be employed again); it is left exposed for a few minutes, and then covered with dry lint.

OBJECTIVE AND SUBJECTIVE PHENOMENA.

Chromic acid in solution communicates its color unaltered to the parts moistened with it; after a few minutes the color becomes gradually darker, changing from light brown to dark brown. The parts to which it has been applied remain moist, bright, and glossy for from ten to fifteen or twenty minutes: the acid then gradually dries, and changes the surface it rests on to a dark brown, partly bluish black, dry elevation, which slowly becomes thicker, and after forty-eight hours either falls off spontaneously, about one or two lines in thickness, or can easily be separated in its entire extent. The ulcerated surface left by the scab is generally covered with a firmly-attached greyish-white exudation, which, in from twenty-four to forty-eight hours gives place to clean granulations, of which the cutis forms the substratum. The scab formed after the application of undissolved chromic acid is thicker, adheres longer, (from five to six days), and the loss of substance is very much more considerable. The inflammatory symptoms in the surrounding parts are very trifling, the redness is scarcely two or three lines in width, and there is little or no swelling.

If chromic acid be applied to sound parts, a moderate sensation of burning commences in ten or fifteen minutes after the application, increasing for three or four hours, and then diminishing for about an equal space of time. Its application to ulcerated or excoriated parts excites similar sensations instantaneously; these likewise increase for four or five hours, seldom remain stationary, and again diminish during an equal period.

Undissolved chromic acid causes severer and more permanent pains; these are also more violent when the cutis vera itself, and not morbid growths is cauterised, and for this reason each succeeding cauterisation of such growths is attended with more pain than the preceding one. The pain does not disturb the patient's sleep, is incomparably less than that caused by other caustics, such as sulphuric or nitric acid, nitrate of silver, nitrate of mercury, corrosive sublimate, caustic potassa, Vienna paste, &c. The solid chromic acid, on account of its penetrating action, should be employed but seldom, and then with extreme care; and for the same reason the concentrated solution, which has been found sufficient to destroy condylomata of seven lines in height in six applications, is to be preferred.

According to the experiments of Dr. Heller, all organic compounds are soluble in the easily deoxidisable chromic acid, their ultimate elements being raised to a higher degree of oxidation, and partly uniting with the acid. An elevated temperature accelerates this process. Smaller animals, (mice, birds, &c.) were so completely dissolved by chromic acid within fifteen or twenty minutes, that no trace of their bones, skin, hair, claws, or teeth could be discovered.

Chromic acid would thus appear to be not only a gentle and gradual escharotic, but also a complete and rapid solvent.—*Wiener Medizinische Wochenschrift*, 1851, No. VIII. p. 119.

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ON THE ELIMINATION OF CERTAIN POISONS. COMPARISON OF PROCESSES OF INVESTIGATION. ACTION OF ETHYLAMINE AND AMYLAMINE ON THE ANIMAL ECONOMY.

BY M. A. F. ORFILA.

WHEN a poison has been absorbed and carried into the different tissues of a living being, does it remain indefinitely in these tissues, or is it expelled from them?

In the latter case, in how long a time does the animal economy effect this expulsion?

Finally, by what way is the poison conveyed out?

These three questions include all that relates to the elimination of poisonous substances.

The experiments relative to this study require a very long time. In eighteen months I was able to experiment on only four poisonous substances—bichloride of mercury, acetate of lead, sulphate of copper, and nitrate of silver.

These experiments have taught me that when bichloride of mercury, acetate of lead, sulphate of copper, or nitrate of silver is administered to animals:—

Mercury disappears in general from their organs in eight or ten days. In only one case I found it to take eighteen days.

Lead and copper are found in the intestinal parietes and in the bones eight months after they have ceased to be introduced into the stomach.

Silver, whose presence in the liver may in some cases be demonstrated after six months, is not found in any organ of other animals seven months after the administration of nitrate of silver.

In the course of these researches, I have seen that lead, copper and mercury pass into the urine; but whilst the two former are carried away by the renal secretion, only during two days after the administration of the compound of copper or lead, the mercury continues to be carried off by this excretion eight days after the introduction of the mercurial preparation. I have never been able to detect silver in the urine of animals which have taken nitrate of silver.

I beg for a moment to call attention to the applications which may be made by the medical jurist of a knowledge of the elimination of poisonous substances. When I began this work, I had especially the view of facilitating the solution of some problems which might impede or stop the course of justice, if the practitioner did not posses the most precise knowledge on this portion of toxicological physiology. A few examples will suffice to show the benefit to be derived from this study in medical jurisprudence.

A. An individual who had been subjected to a mercurial treatment by corrosive sublimate died four months after the cessation of the treatment, being poisoned by a mercurial preparation. The analysis which is performed by the processes hitherto known (and henceforth I shall suppose this condition), detects mercury in the organs. The defence is able, in consequence of these antecedents, to raise strong doubts as to the origin of the metal. According to my experiments, we can ascertain that this mercury does not proceed from the mercurial medicaments taken four months previous to death; for after the administration of corrosive sublimate, the mercury does remain in the animal tissues more than eighteen days.

B. Should a man survive a poisoning by corrosive sublimate for fifteen days, it is very possible that the chemists consulted in the case would find no mercury in the organs. They would, however, commit a great error should they conclude that there had been no attempt to poison. This error is impossible when we are acquainted with the above-named facts.

C. A workman in a white lead factory died two months after having ceased to manipulate saturnine preparations. In his organs the chemist finds lead. Had this lead been given criminally, or does it proceed simply from the compounds absorbed by the workman in the factory? To give a satisfactory reply to this question, the operator must carefully study the developement and the symptoms of the malady which preceded the death, and combine these facts with those furnished by the study of elimination.

COMPARISON OF THE PROCESSES HITHERTO PROPOSED FOR THE DETECTION OF LEAD, COPPER, AND MERCURY CONTAINED IN ORGANIC SUBSTANCES.

It is rational to make this comparison before studying the elimination of saturnine, cupreous, and mercurial preparations. Of what use would have been the experiments made on this point if I had not investigated these metals to find the most sensible process? As this comparison necessitates a number of investigations, I have devoted to it a special chapter of the memoir which I have the honour to submit to the judgment of the Academy.

Three processes are employed in the

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search for lead and copper; they really differ from each other only in the agents employed in the carbonisation of the animal matter. These agents are:—

1st, Nitric acid.

2nd, Nitric acid mixed with one-fifth of chlorate of potassa.

3rd, Sulphuric acid.

From my experiments I conclude that the carbonisation by nitric acid is superior to the others; that the mixture of nitric acid and chlorate of potassa does not give good results; and finally, that carbonisation by sulphuric acid is far inferior to the others.

When we seek for mercury, the best of the known processes consists in carbonising the organic matter with sulphuric acid. M. Lanaux proposes the destruction of this matter by a current of chlorine. Comparative experiments have shown me that this last process is more sensible than the former.

ACTION OF ETHYLAMINE AND AMYLAMINE ON THE ANIMAL ECONOMY.

Having been struck by the analogies which the physical and chemical properties of these bases present with those of ammonia, I wished to ascertain if any analogy existed in the effects produced by these substances in the animal economy.

Dogs subjected comparatively to the action of these alkalis and ammonia present the same symptoms of poisoning, and the same lesions of the tissues. The analogy is complete when these bodies are introduced by the digestive tube, or when the animals are made to breathe an atmosphere charged with these substances.—*Comptes Rendus*, No. 3, January 19, 1852.

ON THE MEANS OF DETECTING THE PRESENCE OF THE SYRUP OF FECULA IN THE SUGAR SYRUPS OF COMMERCE.

BY E. SOUBEIRAN.

I HAVE already published a note on this subject in the *Journal de Pharmacie et de Chemie* (vol. xviii., p. 328), and to that I shall refer the reader for all relating to the details on the use of the saccharometer; but some points in that notice were not sufficiently explained, and I have since had an opportunity of making further useful observations on the subject. These will form the object of the following memoir.

ON THE SYRUP OF SUGAR.

Pure syrup of sugar at 35°, is not precipitated by spirit containing 86 per cent. of alcohol, it does not become colored to any extent when heated and boiled with a little caustic potash, nor does it redden when mixed with a few drops of ioduretted iodide of potassium.* The same syrup diluted with nine volumes of water, marks 52° to the right by the polariscope saccharometer; when heated in the water-bath with one one-tenth of its volume of hydrochloric acid up to the temperature of 68°, and observed in a tube of twenty-two centimetres, it will be found to mark 20° to the left.

If the syrup has been made of sugar of an inferior quality, or has undergone a slight fermentation; or again, if the sugar has been used for preserving fruits, then it will contain inverted sugar. It acquires under these circumstances the property of becoming brown on the addition of potash; but it is not reddened by the ioduretted iodide of potassium, nor is it precipitated by alcohol, characteristics which distinguish it from syrup which has been mixed with syrup of fecula.

A syrup of this kind has the right-handed rotation weaker than that of the syrup of pure sugar; but after inversion, we find the left-handed rotation which would have belonged to this syrup.

This case is often met with in the analytical study of syrups, and it must be borne in mind, otherwise we may confound such syrups with those mixed with fecula.

SYRUP OF SUGAR MIXED WITH SYRUP OF FECULA.

A mixture of syrup of sugar and of syrup of fecula, when boiled with a small quantity of water and caustic potash, blackens and diffuses an odor of caramel.

On diluting the syrup with its volume of water, and adding a few drops of ioduretted iodide of potassium, the liquor becomes red. This is a marked reaction; by this means one-fiftieth of syrup of fecula is easily detected. For smaller quantities it is a good plan to have by the side of the glass in which the experiment is made, a second glass containing the same volume of water, to add the same quantity of the reagent in both of them, and then to compare the shades of color. It whitens and precipitates when mixed with several times its volume of alcohol. the deposit is formed with dif-

* This reagent is prepared by dissolving 2½ grammes of iodide of potassium in 100 grammes of water, and then adding to the solution so much iodine that a portion of it shall remain undissolved. The liquor is retained on its excess of iodine.

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ficulty, and at last we find at the bottom of the vessel a syrupy liquid, opaque but very thick.

This reaction is very hazardous, as in the hurried tests which have to be made at the dealers, we might be deceived by the deep brown coloration which the syrup would take under the influence of alkalis, which may result from the presence of inverted sugar. There is, however, not much fear of mistake when, in addition to the coloration by potash, is added the character of the precipitation by alcohol, unless you were acting on syrup of gum; but the ioduretted iodide of potassium is a certain test. The red coloration which it produces is a manifest indication of the presence of the dextrine which always forms a part of the syrups of fecula and of commerce. This reagent is furthermore useful in having nullified an argument used by the adulterators, founded on exaggerated assertion of M. Bouchardat. This chemist has asserted that glucose may be produced by the long exposure af syrup to heat. And that I had seen it formed after an ebullition of fifty hours. The fact in itself is questionable, and might form the subject of a controversy; but this is not of moment in the present instance, and it does not affect the opinion to be given on the adulterated syrups; for the presence of dextrine in syrups is a sufficient and incontestable proof of their adulteration.—*Journal de Pharmacie, and Pharmaceutical Journal.*

BALSAMO-ALKALINE CAKES.

BY M. DELIOUX.

	grammes.
℞ Balsam of Tolu	150
Bicarbonate of soda	75
White sugar	2000
Gum tragacanth	20
Alcohol at 86 degrees	150
Distilled water	300

CAKES OF BALSAM AND AMMONIA.

The same elements in the same proportions, merely replacing the bicarbonate of soda by bicarbonate of ammonia.

Dissolve the Balsam of Tolu in alcohol, with the aid of heat; strain it through linen; replace the solution on the fire; add 300 grammes of distilled water, and heat it on the sand-bath to drive off the alcohol; then add, stirring constantly, the gum tragacanth in fine powder, so as to make a thick mucilage.

On the other hand the sugar and bicarbonate of soda or ammonia have been pulverised, and passed through a fine sieve; they are formed into a paste with the mucilage in a mortar; it is divided into cakes of a gramme in weight.

These cakes should be dried at a moderate temperature, so as not to decompose the alkaline bicarbonate otherwise than by the reaction produced by the principles of the balsam of Tolu on this salt; so that, in one word, there should not be formed, in the mass, either carbonate of soda or carbonate of ammonia, which would give a very disagreeable alkaline taste.

The form of cakes or pastilles which I have given to the balsamo-alkaline preparations appear to me useful for hospital practice; but should these medicaments deserve to become general in private practice, it would be preferable to present them under a form which would render their administration more easy and agreeable, for instance, in the shape of comfits. The proportions of the different materials might at the same time be modified so as to render the calculation of their absolute and relative quantities prompt and simple. Thus:—

	grammes.
℞ Balsam of Tolu	50
Bicarbonate of soda	25
Sugar	175

Which would make a total mass of 250 grammes.

As above mentioned, the balsam of Tolu is to be treated by alcohol, and its alcoholic solution precipitated by distilled water, so as to obtain it in a state of the greatest division possible. By heating in a sand-bath the alcohol is driven off, and great part of the water is dissipated likewise; there will therefore remain a small quantity of water when the operation of desiccation is finally completed, and too small a quantity of gum tragacanth will have been used (it may be omitted entirely, if desired), to take an exact account of this gum tragacanth and the water of interposition in the pills or comfits which are the result of the division of the balsamo-alkaline mass.

If then this mass be divided into 1000 equal parts, we shall have pills weighing each exactly 25 centigrammes, and containing:—

	gram.
Balsam of Tolu	0·05
Bicarbonate of soda	0·025
Sugar	0·175
	0·250

Add, saccharine matter to envelope the comfits, 250 grammes, and you have comfits weighing each 50 centigrammes.

One comfit will contain:—

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	gram.
Balsam of Tolu.....	0·050
Bicarbonate of soda.....	0·025
Sugar.....	0·425
	0·500

These comfits contain a smaller proportion of sugar than the analogous cakes; it will only be in the proportion of 8·5 to 1 of balsam of Tolu. It would therefore be possible that the central pillular mass would have a less agreeable taste, but it would be surrounded by a layer of pure sugar, which, in dissolving in the mouth, would attenuate the flavor of the balsam and alkaline bicarbonate, and at last, the the taste, whatever it were, might be avoided, the comfit, from its small dimensions, being able to be swallowed entire or as soon as suction had reduced it to the central medicinal nucleus.

20 comfits would represent 1 gramme of balsam of Tolu, 50 centigrammes of bicarbonate of soda or ammonia. From 10 to 80, or even 100, might be taken in the day; as an average, 40 to 50 should suffice.

According to the principal indications of complaints of the chest, we may add to the comfits of balsam and soda certain determined quantities, which may be easily calculated in divisions, of extract of opium, kermes mineral or ipecacuanha.

The following quantities may be fixed for these new formulæ.

For the above pillular mass of 250 grms.

1st, Opium..... 0·50 grammes.

So that 100 comfits would contain 0.05 grm. of opium, and each one 0·0005.

2nd, Kermes mineral.. 2·50 grammes.

So that 100 comfits would contain 0·25 grm. of kermes, and each one 0·0025.

3rd, Ipecacuanha.... 2·50 grammes.

So that 100 comfits would contain 0·25 grm. of ipecacuanha, and each one 0·0025. —*Journal de Pharmacie et de Chimie*, January, 1852.

THE INFLUENCE OF HUMID CHLORINE IN THE TREATMENT OF GLUCOSURIA.

BY M. BOBIERRE.

THE experiments of Senor Alvaro Reynoso have enabled us to prove the concordance which exists between certain phenomena of the respiratory action and the presence of sugar in the urine. The observations of M. Bouchardat on the favorable influence of inspirations of oxygen in glucosuria, accord perfectly with the analytical results of Senor Alvaro Reynoso, and enable us to see the possibility of a treatment based on the re-establishment of the proportion between the combustible substances of the organism and the gases necessary to combustion introduced into the lungs.

I thought that if oxygen could be classed among the therapeutical agents proper to combat the presence of sugar in the urine, that is to say, during pleurisy, chronic bronchitis, asthma, etc., we could only have recourse to its use by freeing it from the inconveniences mentioned by M. Bouchardat; inconveniences which have, moreover, always accompanied the use of oxygen.

In a work addressed to the *Académie des Sciences*, on February 7th, 1848, and the conclusions of which were inserted in the *Comptes Rendus* of its sittings, I believe that I proved, by precise experiments, 1st, That the special action of humid chlorine in certain affections of the lungs is attributable to the oxygen set at liberty by the decomposition of the water; 2nd, That the inspiration of humid chlorine, long since proposed as useful in the treatment of phthysis, produces a general excitement due to the properties of the nascent oxygen, and not to a special action of the chlorine; 3rd, That the inspiration of the oxygen in the nascent state, obtained by this means, could not be replaced by the introduction into the lungs of oxygen previously collected and enclosed in any reservoir whatever.

I have been led to enquire whether the use of nascent oxygen obtained by the inspiration of a small quantity of humid chlorine could be usefully adopted for the purpose of remedying the inconveniences mentioned by M. Bouchardat. The only case in which I have been able to make a perfect observation was characterised by a well determined pulmonary emphysema. The urine precipitated by sub-acetate of lead, filtered, then deprived of the excess of lead salt by chloride of sodium, and finally treated by beer yeast on the one part, and by the alkaline solution of tartrate of potassa and copper on the other, furnished the characteristics of a manifestly saccharine liquid. Under the influence of the chlorine, of which the dose was gradually augmented, I saw the sugar diminish until the normal conditions of the respiration were completely re-established.

If, which belongs to medicine to determine, the inspirations of oxygen can have any useful result in the treatment of glucosuria, it is to be desired that these inspirations should preferably be effected

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with the aid of nascent oxygen; that is to say, obtained by fumigations of the steam of chloruretted water. To decide this question, it would be useful to employ these fumigations whilst chemically examining the urine, in pathological cases where the hematosis is incomplete. — *Comptes Rendus*, No. 3., January 19th, 1832.

OBSERVATIONS ON ETHERIFICATION BY CHLORIDE OF ZINC.

FUSED chloride of zinc is easily soluble in concentrated alcohol; and every one knows that when this solution is distilled, we obtain alcohol mixed with an increasing proportion of ether.

This faculty which chloride of zinc possesses, of etherifying alcohol, has long been known: and, nevertheless, only a very imperfect explanation of it has been given, owing, doubtless, to the various products of the operation not having been studied with all the care desirable.

If, indeed, after having dismounted the apparatus in which the distillation has been made, we attentively observe the composition of the liquid contained in the receiver, we find that, independently of the alcohol and ether, it always contains more or less hydrochloric acid; and, if we push the observation further, we ascertain that the quantity of this acid is exactly proportional to that of the ether produced.

In the same way, if we carefully examine the products of the retort, it is ascertained that, besides chloride of zinc and alcohol, a certain quantity of free oxide of zinc is always found, and that this oxide of zinc corresponds perfectly in its proportion to the hydrochloric acid of the receiver.

This attentive observation of facts shows that chloride of zinc etherifies alcohol only by undergoing decomposition, and the theory of its action is then reduced to a simple play of affinity. Thus, in proportion as the temperature is raised, the force which retains the two elements of chloride of zinc united, gradually loses its intensity; whilst, on the contrary, that which tends to unite each of its elements to the oxygen and the hydrogen is progressively exalted to the point of surpassing the former. Then the decomposition ensues, and, as a consequence, the alcohol is converted into ether.

As the chloride of zinc is formed of one equivalent of zinc and one of chlorine, it is easy to see that the alcohol must lose the oxygen and hydrogen in the proportions which constitute water. But it must be borne in mind, and, indeed, it is demonstrated by this experiment, that they do not exist in alcohol in the state of water. And, indeed, when an aqueous solution of chloride of zinc is submitted to distillation, however concentrated this solution may be, and however the experiment may be varied, no decomposition is ever manifested. The water passes over unaltered, and neither hydrochloric acid nor oxide of zinc is found among the products. Thus, when the oxygen and hydrogen are combined in the state of water, the affinity of the constituent principles of the chloride of zinc is incapable of destroying their combination; and, since they are separated in the case of alcohol, it must indeed be admitted that they exist in it in another state.

If, then, alcohol does not contain water ready formed, should we be astonished that bodies possessing an extreme affinity for water, like chloride of calcium, cannot etherify alcohol; whilst other chlorides, having a less affinity for water, like those of zinc and iron, are perfectly capable of effecting this transformation? It is sufficient to bear in mind that the condition is not only to remove the water, but to produce it. Chloride of calcium cannot convert alcohol into ether, because its constituent principles are so intimately united to each other, that they cannot be separated by the simultaneous attraction of the oxygen and hydrogen contained in the alcohol. On the contrary, the chlorides of tin, antimony, and iron, whose elements present about the same degree of stability as those of chloride of zinc, give rise to the same phenomena as it does, and are equally adapted for the production of ether. It is also the same with fluoride of boron, fluoride of silicium, all substances which decompose water, giving hydrofluoric acid, and boracio and silicic acids. These facts speak highly in favor of Dr. Mohr's theory concerning the generation of ether.—*Buchner's Repertorium.*

ON SOME EFFECTS OF ATROPIA AND OF THE SULPHATE OF VERATRIA.

BY DR. GIACINTO NAMIAS.

FOLLOWING the example of Dr. Lussana, the author tried atropia in the treatment of epilepsy, in the Civic Hospital of Venice, to which he is chief physician. The dose he employed was the twenty-fourth part of a grain, five or six times a day, dissolved in water by means of acetic acid, and he satisfied himself that this alkaloid is an efficacious remedy in many spasmodic diseases. He has also applied it by inunction on the

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sound skin, as recommended by Dr. Closio, in the proportion of a grain to a drachm of lard. The phenomena produced by its action when the dose used is too strong are, dilatation of the pupil, indistinctness of vision, confusion of ideas, slowness in answering, difficulty of certain voluntary movements, a sense of weakness, and occasionally vomiting. And since in epilepsy, as well as in many other forms of nervous spasmodic affections, particularly when of long standing, two etiological elements generally co-exist, viz., a permanent morbid condition or organic lesion, oftentimes only recognisable by the anatomist, and a peculiar predisposition in the nervous fibre, determining the convulsions, atropia, by modifying the nervous susceptibility, will assist in diminishing the intensity and frequency of the attacks, and will thus give time for the cure or alleviation of lesions of the first class; and when an abnormal condition of the fibre exists alone, will be sufficient to eradicate the disease. The illustrious Bufalini, too, observes the author, arrived at the conclusion that tetanus consists of two elements, an exciting cause and a peculiar modification of nervous action, a special *neurokinesis*. The author believes atropia to be always useful in spasmodic affections; whether it be administered internally or applied topically, its action, when properly used, is not only safe, but decidedly soothing.

As to the sulphate of veratria, recommended by Magendie in dropsies as an exciter of the action of the kidneys and bowels, (effects not verified by Namias), he says that it acts upon the cutaneous surface, in various parts of which it produces a sense of pricking, formication and heat, which latter sensation extends from the throat and epigastric region to the skin itself. Of the sulphate of veratria, which is very soluble, the author gave from half a grain to two grains, in six ounces of water daily, in neuralgic affections and in rheumatic pains.

This salt excites the pulse, and in general produces perspiration, with alleviation of the pains; it is contra-indicated if acute inflammation or fever be present, causing in such cases vomiting, frequently diarrhœa, tormina, and prostration of strength. In order to increase its good effects, the author, at the same time that it was given internally, directed the ointment of atropia to be applied externally, and quotes cases showing the beneficial results of this mode of treatment. Its external application gives rise to the same phenomena as its internal exhibition. The author is engaged in investigating chemically the cutaneous exhalations in persons treated with veratria, and from such a man science may expect much.—*Giorn. Ven. delle sc. Med.* 1851. *Bulletino delle Scienze Mediche di Bologna*, August and September, 1851, p. 178.

THE CLEW BAY COPPER AND SULPHUR MINES.

We have received a prospectus of a Company which is now being formed for working these extensive and valuable mines, which are situated at Clew Bay, county Mayo, Ireland. It is stated that some of the copper ore contains 24½ per cent. of copper, and the iron pyrites 40 per cent. of sulphur. The property on which these mines are consists of 8000 acres. We are truly glad to see that the spirit of enterprise is being directed to the working of mines in Ireland; and we have no doubt that the undertaking will be crowned with such success as to reward the adventurers, and incite others to follow their example.

BOOK RECEIVED.

The Process of Thought, adapted to Words and Language. Together with a description of the Relational and Differential Machines. By Alfred Smee, Esq., F.R.S., &c. &c. &c. London: Longman and Co., 1851, pp. 77.

TO CORRESPONDENTS.

"Mr. A. C. Wilson." We will consult the works in question, and reply to you in a few days, by post, if you will favor us with your address. You will also oblige us by stating your point of doubt more fully.

"C. P." We will endeavor to procure the information you require. Let us have your address.

Answered by Post.—Mr. Perry; X.Y.Z.; M.D.; A Chemical Student; Juvenis, J. S.; Pharmacien.

"Mr. Nixon." Too late for this month.

NOTICE.—*All Communications, Books for Review and Substance for Notice must be addressed* "To the Editors of The Chemist, care of Messrs. W. & T. Piper, Paternoster Row, London." *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following No. will in future be received as late as the 20th.*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

BIOGRAPHY OF PARACELSUS.

BY M. CAP.

THERE are two modes of appreciation applicable to the men and the things of past times: one relates to the works, to the results which have been acquired by civilisation; the other to the circumstances in the midst of which personages and their acts were revealed. The effect of the age on celebrated men, and, at the same time, the influence of these men on their age, are the bases of the judgment which we have to pass on both. Every examination in which one of these two elements is neglected incurs the risk of being tainted with error or partiality.

That which, in other ages, seemed to be a brilliant truth may now appear to us to be a deplorable error; and the science of our days has a right to do full justice to it; but history does not appreciate with the same strictness. This theory, at its real date, was an important step in the search for truth. It embraced the state of knowledge, the works, and the prospects of the period when it was originated: its natural aspect must therefore be left to it. The historian of science does not proceed like the professor; his judgment, consequently, cannot have the same character; and, without differing in reality as to the absolute value of facts, he considers them also in a relative manner, having regard to the circumstances which accompanied their appearance.

This, perhaps, explains the frequent differences between men of science and learned men,—the former viewing knowledge only in its present state, sometimes limiting science to that which they know themselves, and too lightly esteeming that which was known before them; the latter seeking with a certain obstinacy, in past ages, the traces of a discovery on which our age prides itself, and noticing the dangers to which a fatal ignorance of the past too often exposes us.

I found it necessary to enunciate these views as soon as I cast my eyes on a personage who has long enjoyed a very strange celebrity, and concerning whom his contemporaries, as well as posterity, have formed very contradictory judgments. I am not astonished, therefore, at finding amongst those who disdainfully scorn him, *savants*, that is to say, men of science in its *existing contemporary state*, and at finding more indulgence for his faults, more goodwill towards his doctrines, sometimes even some admiration for his genius, amongst the historians of science, the explorers of the past, in a word, among learned men.

Philip Auriol Theophrastus Bombastus* von Hohenheim, better known under the name of PARACELSUS, was born in 1493, at Einsiedeln, in Switzerland, a burgh of the canton of Schwitz, the seat of a celebrated abbey of Benedictines, and from whence Zwinglius launched, a year before Luther, the first attacks against the Court of Rome. His father, who practised medicine at Willach, in Carinthin, was nearly related to a grand prior of the order of

* The word *Bombast* has become, in English, the synonym of inflation, and boasting.

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Malta, which shows that he was not, as has been stated, of very obscure origin. His early education was neglected; his youth was that of a wandering student. In his incessant perigrinations, he treated patients, predicted the future, practised astrology and the cabalistic art, in which he had been initiated by his father, by the Abbé Tritheim, and by other German astrologers and alchemists. In Saxony, he visited the mines, and consulted the metallurgists: he labored at the investigation of the great work in the wealthy family of Fugger, of Augsburg.* During a journey in Poland, he was taken and carried away by the Tartars, amongst whom he acquired some further alchemical knowledge. He afterwards went into Egypt, and to Constantinople, where he acquired additional knowledge of alchemy. He afterwards travelled throughout Europe, associating particularly with physicians, astrologers, and charlatans, not disdaining to ask secrets and receipts from bagnio-keepers, old women, zingari, magicians, and executioners. Thus it it was not in schools or in books that Paracelsus acquired his extensive and varied knowledge, but by travelling and verbal traditions. He read and wrote little; his lessons, and the numerous works attributed to him, were collected, and evidently amplified by his pupils and his followers.

At this period alchemy began to lose its credit. True men of science regarded it as a deception, and abandoned it to charlatans. Paracelsus wished to reinstate it in the public estimation. His lively and ardent spirit, his enthusiastic character, his cosmopolite education, and, finally, fortunate chances, furnished him the opportunity. He had derived his means from theosophists, the illuminati, as well as from men of science of the countries through which he had passed, and he devoted himself to practicing alchemy, surgery, and medicine. Furnished with all these arms, he wished to make an application of them; but he could not wait for slow and modest successes. A few successful attempts having encouraged him, he gave way impetuously to his imagination, and very soon believed in his own infallibility. Young adepts, seduced by his inflated eloquence, and by the prestige of his convictions, also exalted his confidence, encouraged his audacity, and prepared for him new successes.

Paracelsus returned to his own country in 1526. A brilliant cure, that of the famous printer, Frobenius, attracted general attention to him, and gained for him the chair of physic and surgery in the University of Basle. Once in possession of this tribune, his illusion knew no limits; he flattered himself that he governed science. He thought he had found the means of doing so in the mineral remedies which he derived from alchemy. He broke with the traditions of antiquity and of the Arabs, and declared himself the equal of all the physicians of his own or former ages. His assurance and his movements of inspiration seduced and electrified his auditors to such a degree, that, in going out from one of his lectures, they threw into the fire the writings of Hippocrates, Galen, Avicenna, and Averrhoës. This scene was the pendant of the *auto-da-fé* of Wittenberg (1520), when Luther delivered to the flames the bulls of the Holy See.

This period was the apogee of the glory of Paracelsus, or rather of the enthusiasm which he inspired. The novelty of his ideas, the vehemence of his speech, the custom which he adopted of professing in the native language, his marvellous cures, all contributed to obtain for him fanatical partisans. Princes called him near their person, and loaded him with presents and favors; men of science consulted with him, and corresponded with him. This great success was not long sustained. Paracelsus carried the rage of innovation beyond all limits, and to extravagant heights. Before the age of twenty-five, he was sober, and had drunk nothing but water, but after that time, he contracted habits of intoxication and disgraceful inclinations. He gave himself up to society unworthy of him. He was habitually intoxicated, slept in his clothes, slept little, and awoke in the middle of the night, transported with enthusiasm and frenzy. His fit over, he dictated a few chapters of science; but it will be readily imagined that, writing under the inspiration of a sort of intoxication, and in some measure scorning deliberate observation, his ideas must have been strange and inordinate.

A line of formidable enemies was already formed against him: some reverses in his practice had also shaken his reputation. Thomas Erastus, who was to succeed him in his professorial chair, Oporin, his secretary and friend, whom he was foolish enough to estrange from himself, spread ill-natured insinuations concerning his conduct. He was soon regarded as a madman or a charlatan. Proceedings were taken against him, and he was assailed with sar-

* This celebrated family, which had been enriched by commerce, was also considered to have acquired a portion of its fortune by the aid of its alchemical knowledge.

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casms.* Paracelsus could not withstand these outrages; he relinquished his teaching and his medical practice, quitted Basle, and resumed his life of wandering theosophy. This errant existence lasted for several years. Finally, on the 24th of September, 1541, after a debauch, he was seized with apoplexy, and died at Salzburg, in a hospital, at the age of forty-eight years.

Paracelsus may be regarded in several points of view; but that which interests us most, and which constitutes the principal object of this notice, relates to the impulse, to the new direction which he gave to chemistry. Still, although it is difficult to condense into a general doctrine the works and ideas of this singular personage, we cannot help saying a few words concerning theories of various natures connected with his name.

At the commencement of the sixteenth century, demonology and the cabalistic art pre-occupied all minds. In vain had astrology been prohibited by a Papal bull, by the faculty of Paris, and alchemy by the Venetian Senate. These pretended sciences were still seriously taught in most schools. Men of real knowledge did not refuse to be amongst their partisans. George Agricola, Jean Bodin, Jerome Cardan, and Thomas Erastus, were ardent defenders of them. Felix Plater, Ambrose Paré, and even the judicious Fernel, were not far from adding their faith in them. In the course of the same century, the plague and other epidemics having broken out, astrology and cabalistic practices were first resorted to, and then the whole arsenal of Arabian polypharmacy. These means being exhausted, they had recourse to alchemy, which presented many novelties, some of which proved more efficacious, and quickly attracted the attention of observers.

Opinions were in this state when he came forward as the instigator of an absolute reform in medical doctrines; but the audacity, disdain, the violent attacks on admitted opinions could not suffice, and there was required in the reformer a new doctrine capable of replacing that which he pretended to overturn. He commenced by enunciating a physiological theory, founded on the application of astrology to the functions of the human body. He placed in the stars the origin of the vital force. The sun, says he, acts on the heart and the abdomen, the moon on the brain, Jupiter on the head and the liver, Saturn on the spleen, Mercury on the lungs, Venus on the kidneys, &c. Man, according to him, being composed of a body and a spirit, we can act on the spiritual part only with the aid of means without the ordinary phenomena of nature. He believed in dreams for the revelation of medical means; he regarded magic as the culminating point of the sciences; its study as the first condition to be fulfilled for those destined for a medical career. Finally, he went so far as to affirm that, by means of the cabalistic art and chemistry, we may re-establish health, preserve life, and even form animated beings.

As regards the chemiatric doctrine of which he constituted himself at once the founder and the chief, it was reduced to this proposition—that the composition of the body of man being formed by the concurrence of a salt and of siderial, that is to say, immaterial, sulphur and mercury, and the alteration of this compound being the cause of diseases, they could only be combated by the aid of chemical means, combined with the influence of the stars. To explain the action of medicaments, for the elementary qualities of Galena, he substituted a reasoning being,—the archee,—which seems to fulfil the part of nature in the action of our organs, which combines the elements, selects the materials proper for nutrition, sends away impurities, and re-establishes the equilibrium of the physiological functions. The archee was to him the spirit of life—the siderial part of the human being; the diminution of its strength caused diseases and even death; it was approaching the vital principle of the moderns. As he had adopted the system of genii, he attached one to each natural object, and gave it the name of *olympic spirit*. From this originated the idea of the connections which exist between man and all created beings, and the belief, so long held, which attributed to certain substances properties founded on the natural forms which they affect.

Paracelsus opened, as is seen, the first information, in dogmatic chemistry. From this time, a very clear line of demarcation was established between serious chemists and puffers or alchemists. The latter continued their vain researches, and the former pursued the application of positive facts to medicine and to industry.

He commenced by violently attacking the doctrine of the four elements of Empedocles and Aristotle, for which he substituted the three elements of Basil Valentino, modified according to cabalistic ideas. Thus salt, sulphur, and mercury, which, according

* His enemies called him *Cacophrastus* (evil speaker) in opposition to his name Theophrastus (of divine speech).

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to him, enter into the composition of all natural beings, as well as into the human body, and which, put it in connection with the celestial bodies, were the source of the consistence, the combustibility, and fluidity of the different parts of the organism. This system was also a modification of the doctrine of Anaxagoras, who believed all bodies to be composed of earth, water, and fire.

Notwithstanding all the vagueness and singularity of these theories, it cannot be denied that Paracelsus advanced science by his own investigations, and by the discovery of several facts, of which we find the first mention in the writings which are attributed to him. Thus it is certain that he increased the knowledge concerning the antimonial, mercurial, saline, and ferruginous preparations. He first gave the idea that certain poisons may, in moderate dose, be employed as medicaments. He extolled the use of preparations of lead in diseases of the skin, of those of tin in verminous affections, and of the salts of mercury in syphilis. He used copper, and even arsenic, externally as rubefaciants. He employed sulphuric acid in the treatment of saturnine affections—a mode of treatment still existing in therapeutics. He distinguished alum from the copperases, remarking that the first contains an earth, and the latter metals. He mentioned zinc, which he regarded, indeed, as a modification of mercury and bismuth. He admitted the existence of other elastic fluids than the air which we breathe, as muriatic acid gas and sulphurous vapor, but he regarded them as formed of water and fire. The spark of the steel was in his opinion a product of fire contained in the air. He had remarked that when oil of vitriol acts on a metal, an *air* is disengaged, which is one of the elements of water. He was aware that atmospheric air is indispensable to the respiration of animals, and to the combustion of wood; he said that calcination kills the metals, and that charcoal reduces or revivifies them. "There is a certain thing," says he, "which we do not perceive, and in the midst of which all beings are placed. This thing, which comes from the stars, may be thus conceived: fire, to burn, requires wood, but it also requires air. Therefore fire is life, for, without air, all beings would perish from suffocation." Besides, he said that digestion is a solution of the aliments, that putrefaction is a transformation, that every living thing dies to be resuscitated under another form. Do not these great physiological and chemical views—these comparisons between combustion and respiration—bear the character of a remarkable penetration, and of a spirit of generalisation of the greatest eminence?

One of the real services which the chemiatric system rendered to medicine was the simplifying of the preparation and employment of medicaments. Paracelsus rejected the use of electuaries, confections, and the monstrous and disgusting mixtures of Arabian polypharmacy, and substituted for them more simple means, such as the tinctures, essences, extracts, and especially mineral preparations. He endeavored to obtain more advantage from vegetables, by extracting from plants what he called the quintessence or ether of Aristotle, which he regarded as the principle of their action. This quintessence (*quinta essentia*), a word previously created by Raymond Lully, was his *predestined element*, and represented the proper quality of his other elements, which constituted only its form, consequently it was in it that the medical property resided. His successors called it the *pure of the mixture*, the *seminal essence*, and the *soul* of the substance, whilst the other parts, or *impure* elements, were its *caput mortuum*, the phlegm or the bodies, the box destined to contain this essence: finally, it is to Paracelsus that we owe the distinction between magistral medicaments (which require the intervention of the master) and officinal preparations, which are found ready made in pharmaceutical establishments.

It is not certainly known what Paracelsus called *alkaest*,* a liquid which he regarded as the universal solvent. It has been thought that it was the alkali par excellence (*alkali est*). This idea belongs less, moreover, to the master than to his pupils, for he did but point it out. Van Helmont, among others, gave it a certain developement, without rendering it much more clear or more applicable.

Paracelsus placed in the first line among his therapeutical agents mercury, sulphur, antimony, iron, arsenic, and tin; then opium, aloes, and sulphuric acid. He administered internally iron rust, sulphate of iron, and alum. We owe to him several important pharmaceutical preparations: the tincture of hellebore, compound tincture of aloes (*elixir of propriety*), digestive ointment, the tincture of metals, (lilium of Paracelsus), the saffron of Mars, and several sulphurets. He first opened the way to that part of the science which tends to turn to account the active elements of drugs, in order to be able to employ them in smaller proportions.

Unfortunately, always imbued with his

* *All geist*, in German, signifies all spirit.

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astrological ideas, besides positive properties, he admitted in medical substances the existence of occult properties (*arcana.*) He sought for the harmony which he believed to exist between the constellations and diseases. He studied chiromancy in the leaves of plants, which he regarded as their hands, the nerves of which represented to his eyes cabalistic signs. He thought that the external characters of natural bodies were the symbol of their active properties. Thus, the orchis acts on the genital apparatus, *the stained Euphraise* on diseases of the skin, pulmonaria in affections of the chest. He attached himself to strange drugs, such as the heart of the stag, the bones of the hare, pearls and coral; he employed the magnet im hemorrhage, hysteria, and spasmodic affections. He extolled persicaria, the holy thistle, and other plants whose properties are still more doubtful, so that, whilst ridding the materia medica of many useless agents, he praised others which were no less so. He had faith in talismans, seals, medals, numbers, symbols, and amulets. All this was an evident tribute to the ideas of his period, and perhaps the only means of connecting new ideas with the beliefs then too generally established.

Paracelsus did not believe in the universal panacea, but he admitted a panacea for each disease. It was almost the much more modern doctrine of specifics. With regard to the philosophers' stone, he never paid any attention to it, and he had sufficient impartiality and sagacity to scorn this chimera at a period when it still fascinated the best minds. Moreover, he was disinterested and generous, and treated poor patients gratuitously, and this was, perhaps, one of his greatest sins in the eyes of some of his enemies. We may add that one of his highest titles to respect is his having taken chemistry out of the hands of the gold seekers, in order to devote it exclusively to the advancement of the healing art.

In surgery, Paracelsus rejected the employment of cutting instruments, and even of caustics. He depended only on the efficacy of the archee, and that of certain arcana, and most frequently confined himself to preserving from external agents. He contested the opinion that wounds from fire-arms were poisoned and incurable, as well as the opinion, then general, of pestilential contagion. He thought that nature is capable of deriving from the organism itself a balsam (mumie) with which it moistens wounds and ulcers to cure them, and that certain plants contains an analagous balsam, far superior to all the ointments and plasters of the Galenic pharmacy.

It may be conceived that all these novelties were of a nature to disturb existing ideas. The ardor and vehemence with which they were enunciated were not useless in their propagation. Successes which astonished himself gave him a confidence which he very soon carried to temerity, to folly, and to the farthest flights of charlatanism. When once he entered on this path, he was compelled to pursue it to the end. He openly set up as a reformer, and announced himself as an illuminatus. He pretended to possess infallible arcana, and declared that he regarded no disease as incurable. Either by chance, or happy instinct, he sometimes succeeded in a marvellous manner. It is known that Albert Basa, physician to the King of Poland, who visited him at Basle, on his return to Italy, took him to see a patient who was very much exhausted, and whom he regarded as lost. Paracelsus administered to him a few drops of his laudanum, and invited him to dine with him next day. The patient, who was cured, indeed, went to the invitation.

Thus situated, moderation, logic, and the pure truth were not for him: he required to strike great blows, and to act vividly on the imagination. Now, nothing could succeed better than to surprise by new and decided opinions,—by the paradox which seduced the weak minds, and gave rise to antagonists and contradictors, always so useful to heads of schools for inducing celebrity. It is not with reason and modesty that we act on the masses, but with assurance, enthusiasm, real or affected, and cutting and vehement eloquence. There are, says a moralist, some minds so fond of the marvellous, that improbability is to them a commencement of proof. Luther compared speech to a sword, of which knowledge was only the scabbard.

Few men have been the subject of more unbounded praise, and of more disdainful attacks, than this prince of enthusiasm and of charlatanism. To be just, it must, perhaps, be admitted that he merited one as much as the other. Whilst his enemies pardoned neither his audacity, nor his pride, nor his successes, his partisans called him the king of chemists, the monarch of arcana. The latter raised him to the skies; the others regarded him as a madman, as an heresiarch, as dangerous in matters of science as Luther was in those of religion. He was pursued with fury, and overwhelmed with contempt. The faculty of Paris proscribed his chemical preparations; an act of Parliament forbade their employment. The opposition of the faculty of Paris was carried to violence and fanaticism. Thomas de Mayerne, who had been physician to Henri

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IV. of France, James I., and Charles I. of England, having adopted the use of chemical preparations, according to the system of Paracelsus and Van Helmont, was expelled from the faculty, which, by a special decree, forbade all physicians on earth (*ubique terrarum*) to consult with him. In Germany he was threatened with the stake—a punishment which, a little later, Michael Servet and Etienne Dolet, two really scientific men, did not escape.

Boerhaave judged Paracelsus severely. He says that in the chaotic state in which science was at the time, it was not difficult to pass for a skilful man. He accuses him of having made himself the minister of imposture, of having imposed chemistry on medicine, instead of having rendered it subordinate to the exercise of that art. Zimmermann, his compatriot, makes him the greatest of cheats, the prince of charlatans. F. Bacon says that his address in deceiving himself was prodigious; that when his principles have most foundation, he draws from them conclusions which have none; and that by the false inductions which he derived from experiment, he could not fail to render true men of science reluctant to resort to it after him.

But, to appreciate Paracelsus with impartiality, the period in which he lived must be carefully taken into the account. It was that of illuminati, fanatics and astrologers. His philosphical doctrine, which proceeded from those of Plato, Raymond Lully, and Pic de la Mirandole, was at bottom religious and moral, and fairly considered it was not more unreasonable or more illogical than many systems of the same period. His medical ideas, if he had presented them with moderation and method, were not with out value. Thus he declared that the healing art was not to be learned with masters and in books, but by voyages, by the bedside of the patient and in the laboratory. He shows the importance of the study of chemistry to physicians; he taught the latter to make therapeutical investigations on themselves. He often gives lucid views on the laws of the organism, and on the etiology of diseases. Thus he regards the virus as a ferment, and the fever which accompanies eruptions as a sort of ebullition proper for separating the impure parts of the blood and humors. His ideas concerning gravel and arthritic concretions (de tartaro) are most judicious. By placing man in the first line among animals, and by connecting with his organisation that of all the others, he laid the foundation on which the whole of physiological anatomy is now raised. We may also remark that Galen reigned despotically in medicine as Aristotle did in philosophy; that therapeutical science was still founded on the quatities, humors, degrees and temperaments; that ordinary practice was limited to purging, bleeding and administering emetics, and that Paracelsus had, at least, the merit of turning physicians from this routine practice, as he forced them to attach less importance to the symptoms than to the causes of diseases. With regard to the chemiatric doctrine, of which he was only the promoter, for the idea of it belongs to the chemists of the preceding age, it cannot be denied that it rendered real services and gave a new and forcible impulse to all medical sciences as well as to chemistry itself.

If anything tended to excuse Paracelsus, if not to absolve him, it would be his good faith, his sincere conviction. He believed in the reality of his doctrines as well as in the efficacy of his arcana, and in his intellectual superiority and inspirations. But in abandoning himself to the most absurd beliefs and superstitions, he acted really erroneously in exciting the taste of the age for the occult sciences, and in exalting by his example the extravagant pretensions of their followers. It is very strange that he, on more than one occasion repelled the idea of sorcery. "Before the end of the world," said he, "a great number of supernatural effects, at least in appearance, will be explained by all physical causes." It may be said in this case, that the priest himself endeavored to overthrow the altar of his false gods. Moreover, he obtained his end as a reformer to this extent that, he succeeded, to a certain point in annihilating superanuated doctrines, in drawing science from the sanctuary of the school, in directing medicine into a new path, and in fixing the attention of practitoners on agents of indisputable energy and efficacy. Is this then, a small merit, and in the face of such results, should not some indulgence be shown for the flights of imagination of which the author was evidently the first victim?

His writings, which he did not publish himself, but which his disciples collected, adding to them some apocryphal fragments, form, in the edition of Basle (1589), a mass of ten volumes in folio. Their disconnectedness alone would prove that they had passed through several hands. His travels and the shortness of his life did not admit of his multiplying them to that extent. They accord sufficiently, nevertheless, with what is known of his character and conduct: no systematic plan is found in them: the ideas in them are confused and disconnected and the contradictions are numerous. They are for the most part, notes which may be said to be collected in the order, or rather,

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in the disorder in which they presented themselves to his mind. There is throughout, eccentricity, boasting, a sort of illuminism, from which sometimes lights of genius spring forth. The style is diffuse, obscure, mystical, mixed with German and barbarous Latin, and full of neologisms. Consequently, few men of learning or curious persons have now the courage to undertake the tedious and barren task of reading them.

Be it as it may, Paracelsus was the true head of a school. The ardor and independence of his mind, his natural impetuosity, his satirical vein, his impassioned, picturesque original language, all, even his pride, contributed to make him a thaumaturgus, and he too readily obeyed this fatal vocation. He was not the less one of the greatest synthetical minds of the sixteenth century; it would have been fortunate if he had not carried to excess the faculty of generalisation with which he was endowed in so high a degree. But we also know the period at which he lived. An irregular and violent movement then agitated Europe; the strangest theories and the most opposite systems combatted each other in the schools. The contradictions of Paracelsus, like that of his contemporaries, were the fruit of those intellectual contentions which then arose on all parts. Is it, then, surprising that the truth could not yet be disengaged from such a state of trouble and confusion? And, since it is to chemists that these lines are addressed I may be permitted to make an allusion to an order of phenomena which is familiar to them. The removal of elements is operated in a mixture only when the solution, being sufficiently dilute, is left to itself, and in complete repose. In philosophy as in chemistry, I may add, even in politics, order and truth can be established only inasmuch as the individuals enjoy at once calm, repose, and judicious liberty.—*Journal de Pharmacie*, February, 1852.

CHEMICAL AND PHYSIOLOGICAL STUDIES CONCERNING SILK-WORMS.

BY M. E. PELIGOT.

(Second Memoir.)

THIS work is the continuation of researches which I have undertaken with the view of studying the phenomena which follow each other during the life and the metamorphoses of the silkworm. In my former memoir (see THE CHEMIST, January, 1852), I pointed out the course which I adopted for determining the weight of mulberry leaves required for the development of a given quantity of larva, weighing the litter and the dejections left as residue.

The work which I now present has for its object to follow the passage, and to establish the chemical composition of the inorganic substances found in the various products which I collected during the course of the weighed rearings. I shall hereafter present to the Academy the results furnished by the same investigation as regards the organic elements.

This study presents a two-fold interest:—In a physiological point of view, it establishes the conditions of alimentation which preside over the development of these insects; in an agricultural point of view, it enables us to decide whether the cultivation of the mulberry tree is or is not an exhausting growth, removing from the soil the mineral matters which constitute its fertility.

In order to seek for and analyse these inorganic substances, I commenced by incinerating the various products proceeding from the rearings, the results of which I have given, these products having been weighed in the dry state. The chemical study of the ashes, as regards their preparation and their analysis, presents very great difficulties: the results which they furnish must be accepted only as the value of the processes put in operation is established by the discussion of these processes themselves. I have pointed out, in my Memoir, the precautions which I took in the preparation of the ashes,—which was effected at as low a temperature as possible,—and the course which I followed for the estimation of each of the substances which I found in those ashes.

The following results were obtained by the incineration of the products of the rearing which I made in 1851:

Leaves distributed.—Fresh 1052·5 gr.; dried 265 grammes; they contained 11·6 per cent. of ashes, or 30·7 gr.

	gr.
Products Obtained.—Dry litter, 136 grammes; it left 11·6 per cent of ash	15·7
Dejections 98 grammes, containing 13·8 per cent. of ash	13·5
Worms 143·62 gr., at 14 per cent. of dried matter, 20·60 gr. The dried worms gave 9 per cent of ash, or ..	1·9
	31·1

The following is the mean composition of each of these products:—

Composition of the Ashes.

	Leaves & Litter.	Dejections.	Worms.
Silica	17·6	20·0	3·9

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Carbonic acid ..	18·6	18·0	10·5
Phosphoric acid	10·3	7·6	29·0
Sulphuric acid..	1·6	traces	1·9
Chlorine	0·8	1·2	1·1
Oxide of iron ..	0·6	0·7	traces
Lime	26·2	29·5	8·3
Magnesia	5·8	6·0	9·3
Potassa	18·5	17·0	36·0
	100·0	100·0	100·0

The composition of the ashes of the leaves, litter and dejections, is the mean which results from the analysis of four lots of each of these products collected in about equal times, burned and analysed separately. Each element was estimated directly.

The weight of the ashes left by the leaves, the charcoal being deducted, varies between 12·5 per cent. for the young leaves, and 10·8 for leaves which have attained their full development. This difference is due, probably, to the production of the organic matter increasing more rapidly than the absorption of the saline substances derived from the soil.

All the leaves used in this rearing were obtained from a dozen small mulberry trees, ungrafted, from 7 to 8 years old, placed side by side, and grown at Sévres, in a very calcareous soil.

The nature of the inorganic substances contained in the mulberry leaf explains the preference which silkworms give to this leaf, their sole nourishment. It contains indeed, more considerable quantities of phosphoric acid and potassa than have as yet been found in other leaves. The proportion of of these bodies, given in the foregoing table, is far from exceptional ; leaves collected at Sévres, in a better soil, or procured from the Bergeries of Senart, or from the nursery of the Luxembourg, furnished a much more considerable quantity of phosphoric acid,—exceeding 15 per cent. in three of the samples whose composition I have given in my Memoir.

The proportion of the mineral substances contained in the dejections increases in proportion as the worms advance in age; this is contrary to what is observed as regards the leaves. This proportion varied between 13·2 and 15·1 per cent. of dry dejections; as in the case of the ashes of the leaves, it varies with the nature of the soil. Some dejections, arising from the rearings of M. Camille Beauvais, gave me, several times, 18 and even as much as 24 per cent. of ashes.

As regards the larva, taken after casting their skin, or having fasted, the proportion of the ashes is between 9 and 11 per cent. of their dry weight; it diminishes in proportion as the worms approach maturity. The worms which had begun to spin left, by incineration, only 4 per cent. of ash; they were very rich in phosphate of magnesia: they contained less potassa than those of the worms which had not arrived at maturity. These results are explained, on one hand, by the production of that alkaline liquid from which the worm frees itself when it commences its cocoon, and on the other, by the considerable proportion of inorganic substances found in its last dejections.

The chrysalides, dried, leave from 7 to 8 per cent. of ashes; as the moths emit, before and after leaving the cocoons, liquids charged with saline substances, we find in these insects only about half of the mineral substances which are found in the chrysalides. The male moths give 3·3, and the females 4.3 per cent. of ashes. The dried silk leaves, by incineration, only 1·2 per cent. of ashes.

The eggs of silkworms contain 35·6 of dry matters. The latter furnish 3·6 per cent. of their weight of ashes whose composition is represented by the following numbers :—

Phosphoric acid....	53·8
Potassa	29·5
Magnesia	10·3
Lime	6·4
	100·0

This composition is remarkable in more than one respect; it shows once more the principal part which phosphoric acid performs in the formation of beings; it attributes to magnesia a more important function than is generally ascribed to it. In comparing it with that of the ashes left by the worms at their different ages, it is observed that the work which is accomplished in the insect, is an incessant work of elimination, which has the object of gradually getting rid, under the form of dejections of various nature, of which the silk itself, perhaps, forms part, of the substances which served at once for its development and to concentrate, at the end of its existence, those substances which the reproduction of its species requires. These elements, which may be called *organic*, par excellence, are those which are found in all seeds, in *eggs as well as in seeds*. With regard to inorganic products, the ashes of silkworms' eggs present the greatest similarity to the ashes of a grain of corn; the same elements are met with in it to the exclusion of all others, presenting among themselves, if not the same absolute proportions, at least the same numerical relations. Also, by the side of phosphoric acid which is in predominant quantity, we find potassa, then magnesia,

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the proportion of which always exceeds that of lime.

Does not this unity of chemical composition, which tends to assimilate the animal with the vegetable kingdom, explain the unity, the identity or the resemblance of the organs to which these mineral elements belong? What are these organs in plants and in animals? It is thus that chemical analysis, applied to the elements which preside over the formation of organic products, gives rise to questions certainly worthy of the attention of physiologists.

The analytical results given in this memoir lead, in another order of facts, to ideas by which agriculture may profit. The average quantity of mulberry leaves furnished annually by a hectare of land amounts to 13990 kilogrammes, according to M. de Gasparin. The weight of mineral substances extracted from the soil by these leaves would be about 100 kilogrammes, supposing that the latter contain 30 per cent. of dry matters, which yield 12 per per cent. of ashes.

This quantity is less than that which is removed from the soil by most other crops. It is known, indeed, that it is almost entirely restored to it when the leaves are consumed on the spot, and the litters of the worms and the residues of the spinning are carefully collected and employed as manure.—*Comptes Rendus*, No. 8, February 23, 1852.

RESEARCHES ON COBALT.

BY M. E. FRÉMY.

I ANNOUNCED, some months ago, to the Academy, the existence of a new series of salts, having for bases the elements of ammonia and the various oxides of cobalt. (See THE CHEMIST, New Series, Vol. II, 1850-51, pp. 395, 445).

Since that time my work has been greatly extended, and the series are multiplied, and I now submit to the judgment of the Academy a Memoir in which I make known the mode of production, the properties and the composition, of the new bodies which I designate under the name of *ammoniaco-cobaltic-salts*, and which are produced in in the action of ammonia and oxygen on the salts of cobalt.

Not being able here to describe my experiments in detail, I shall content myself with giving a few considerations, recapitulating the principal results which I have obtained.

All the salts of cobalt, treated under shelter from oxygen with a great excess of liquid ammonia, form a first series of salts which crystallise often with regularity; I obtained the chloride of this series in bulky octohedra. These salts are altered by oxygen which they immediately absorb; water decomposes them and converts them into insoluble subsalts which are of a green color; ammonia dissolves them without alteration; the quaternary base which enters into the composition of these salts is disunited in the presence of water, and gives 3 equivalents of ammonia and 1 equivalent of protoxide of cobalt; the ammonia is disguised in these salts and is manifested only when the base is decomposed. Professor H. Rose had already described combinations of ammonia and salts of protoxide of cobalt, but he did not operate in the conditions which I have just pointed out; he submitted as is known, pulverised salts of cobalt to the action of ammoniacal gas.

I now pass to the series which are formed under the double influence of ammonia and oxygen.

When a soluble or insoluble salt of cobalt is treated with ammonia and afterwards submitted to the action of oxygen, it may produce several new series of salts in which the acids are saturated with quaternary bases whose elements are: cobalt, oxygen, nitrogen and hydrogen. When these bases are decomposed in the presence of water, they give ammonia and an oxide which is always more oxygenated than protoxide of cobalt; the oxide which is precipitated is ordinarily the sesquioxide of cobalt Co^2O^3, and it is frequently accompanied by a disengagement of oxygen. This excess of oxygen which is sometimes disengaged in abundance at the moment when these salts are decomposed, or which is found in the sesquioxide of cobalt, appears to me to be the characteristic property of these new classes of salts which I call *superoxygenated ammoniaco-cobaltic salts*, in order to distinguish them from the series produced out of contact with the air. By studying with care the properties and the mode of production of these superoxygenated ammoniaco-cobaltic salts, I have been enabled to class them into four series, of which I now give the principal characters.

The salts of the first series are of an olive green; these are produced directly by exposing to the air, a concentrated solution of an ammoniacal salt of cobalt. I have obtained in the crystallised state sulphate and nitrate of this series; these salts are stable only in the presence of an excess of ammonia or when they have been subjected to complete desiccation: when put in contact with water, they are decomposed, disengaging oxygen and depositing a green subsalt. The analyses which I give in my

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memoir demonstrate that the quaternary base of this series contains the elements of ammonia and of a binoxide of cobalt, unknown in the free state, whose formula would be CoO^2: this oxide would correspond to the peroxide of manganese.

These green salts, in being decomposed, either by the sole action of water, under the influence of the acids, or in presence of ammoniacal salts, give rise to three other series of superoxygenated ammoniaco-cobaltic salts. The bases which enter into these last three series are quaternary, like the foregoing; on being divided in the presence of water they all give ammonia and sesquioxide of cobalt: they differ from each other only in the number of the equivalents of ammonia entering into their constitution.

The salts of the second series are brown, deliquescent and uncrystallisable: they are produced when the ammoniacal liquors containing in solution the green salts are allowed to decompose slowly in the air.

I obtained the salts of the third series by decomposing the green salts by water, or by an excess of acid; this transformation is always accompanied by a disengagement of oxygen. These salts are remarkable for their crystallisation; the crystals are yellow, red, or of a garnet color: the chloride of this series crystallises in regular octohedra. I have obtained three sulphates which differ from each other in the proportions of acid: the first of these salts, which is produced in presence of a great excess of sulphuric acid, crystallises in small red prisms; the second is of a deep golden yellow; the third is of a garnet color; its crystals are bulky and belong to the second crystalline system, and present the form of the right prism with a square base with pointing in the four faces on the bases. The nitrate crystallises in fine yellow tables.

Finally, the salts of the fourth series are ordinarily of a violet rose color; the chloride, which has been described by several chemists, is obtained by boiling the green or brown salts with an excess of sal ammoniac: this chloride, which is remarkable for its beautiful color, is decomposed by the salts of silver and gives the other salts of this series. All the salts which I have just described form, with the chlorides of mercury and platinum, combinations which are frequently crystalline.

Such are the principal facts which are developed in the Memoir which I have the honor to present to the Academy to-day: they establish the indisputable existence of five series of ammoniaco-cobaltic salts which differ from each other in properties and composition, but whose quarternary bases are formed of the same elements, that is to say, of oxygen, cobalt, hydrogen and nitrogen.

Without wishing to enter here into the discussions which the existence of numerous salts, having for their bases the elements of ammonia and the different oxides of the same metal raise, I may say, however, that the ammoniaco-cobaltic bases are necessarily placed side by side with those interesting bodies containing platinum which have recently been studied with care by MM. Gros, Reiset, and Raewsky; the hypotheses which have been constructed concerning the constitution of these bases evidently applies to the compounds which I have described in this memoir.

We find frequent additions to the number of these ammoniaco-metallic bases which present a certain analogy with the artificial organic bases derived likewise from ammonia, and which, for some years past, have so worthily excited the attention of chemists.

In another work I shall extend to other metals the observations which I have made concerning cobalt.—*Comptes Rendus*, No. 6, February 9, 1852.

ON NITRITE OF LEAD.

BY SENOR ANTONIO GOMEZ.

M. NICKLES announced to the Academy, some time ago, the isomorphism of nitrate of lead and the nitrite of the same metal crystallised with water, without giving, in support of his opinion, either the crystallographical measures, or the complete analysis of this nitrite. The formation of this last salt by carbonic gas, and the small yellow tablettes described by M. Peligot under the name of *hyponitrate of lead*, and considered by M. Gerhardt as a double basic salt of nitrate and nitrite, rendered rather doubtful the composition assigned to the salt considered as nitrite.

I have therefore undertaken, in the laboratory, and under the kind direction of M. Gerhardt, the complete analysis of this compound.

According to the hypothesis of M. Nickles, it should contain 65·4 per cent. of lead. Now all my analyses made on salts perfectly crystallised show that such is not the composition of the body, and that it contains much less lead. I have found exactly the quantity of water mentioned by M. Berzelius. The proportion of nitrogen contained in the salt is too small to be taken into consideration in the discussion of formulæ. Besides, it is the knowledge of the exact quantity of lead which can alone decide the question.

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The following are my analyses :—

	I.	II.	III.	IV.	V.	Formula of M. Nickles.
Lead	63·7	63·7	63·5	63·3	63·3	65·4
Nitrogen	8·3	8·5	,,	,,	,,	8·8
Hydrogen	0·5	0·6	0·6	,,	,,	0·6

The only formula which agrees with these proportions is that of a neutral double salt, composed of 1 atom of nitrate of lead and 3 atoms of nitrite.

$$NO^3Pb, 3NO^2Pb+2Aq.$$

This formula requires :—

Lead	63·8
Nitrogen	8·5
Hydrogen	0·6

It will be perceived that this body is the neutral salt resulting from the decomposition by carbonic acid of a similar, although basic, double salt; only it must be observed that in the decomposition of the latter, nitric acid is eliminated at the same time, for the solution becomes extremely acid by the passage of the carbonic acid; and when left on sulphuric acid, it constantly emits colorless vapors of nitric acid. It is solely by means of this nitric acid that the salt is maintained in solution; for, when the crystals are boiled with water, a great quantity of bibasic subnitrate of lead is formed without any disengagement of gas.

The composition which I have just indicated for the salt, wrongly regarded as a simple nitrite, is interesting, inasmuch as it is entirely similar to that of several other combinations of nitrate of lead, as may be seen by the following formulæ :—

NO^3Pb, PO^4Pb^3+2Aq	Double salt of nitrate of lead and phosphate (Gerhardt).
NO^2Pb, NO^2Pb, Pb^2O+Aq.	Double basic salt of nitrate of lead and nitrite of lead (hyponitrate of M. Peligot).
$NO^2Pb, 3NO^2Pb+2Aq$	Double neutral salt of nitrate of lead and nitrite of lead (Gomez).
$NO^2Pb, 3PbHO$	Subnitrate of lead (double salt of nitrate and hydrate).

It will be observed that, in all these salts, the quantity of lead contained in the nitrate is to the lead in the salts combined with it as 1 to 3.—*Comptes Rendus*, No. 5, Feb. 2, 1852.

ON THE RAIN WATERS OF THE OBSERVATORY OF PARIS.

BY M. BARRAL.

We will confine ourselves to reproducing, as conclusions from our researches, the numbers which represent the quantities of various matters which we have determined directly and appreciated by weight. We think that these numbers will be a first meteorological element of some importance, and that, in pursuing our work, we shall be enabled to put in evidence the variations which the seasons introduce into the matters dissolved in rain water. Analyses made in other places will show the influence of climate on the nature of the water.

Matters determined in the rain water of the terrace of the Observatory, per cubic metre, on the average, from July to December 1851 (*six months*).

	gr.
Nitrogen	6·397
Ammonia	3·334
Nitric acid	14·069
Chlorine	2·801
Lime	6.220
Magnesia	2·100

Matters determined in the rain water of the court of the Observatory, per cubic metre, on the average, from August to December, 1851 (*five months.*)

	gr.
Nitrogen	7·939
Ammonia	2·769
Nitric acid	21·800
Chlorine	1·946
Lime	5·397
Magnesia	2·300

Matters contained at Paris, by rain water, on 1 hectare, in six months (July to December, 1851), at the height of the platform of the Observatory.

	gr.
Nitrogen	13·490
Ammonia	7·032
Nitric acid	29·695
Chlorine	5·910
Lime	13·114
Magnesia	4·450

Matters contained at Paris by rain water, on 1 hectare, in five months (August to December, 1851), at the height of the court of the Observatory.

	gr.
Nitrogen	12·323
Ammonia	4·299
Nitric acid	33·840
Chlorine	3·019
Lime	8·398
Magnesia	3.700

—*Comptes Rendus*, No. 8, Feb. 23, 1852.

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OBSERVATIONS ON TUNGSTIC ACID.

BY M. J. PERSOZ.

When crude tungstic acid, as it is procured from wolfram, is treated with five or six times its weight of nitre, the operation being performed at a gradually increasing temperature, three different salts are obtained, which have distinct characters, and contain acids which cannot be confounded with each other.

When the mixture is exposed to a temperature scarcely higher than the point at which the nitre fuses, only a portion of the crude tungstic acid is attacked, and the bubbles of nitrous vapors cease to be disengaged so soon as this first action is accomplished, provided the temperature remains stationary. On treating the product of this first fusion with hot water, a salt A in solution and an insoluble residue x are obtained.

On treating this residue x with a great excess of nitre, and exposing it to a rather lower temperature than that at which the nitre is decomposed, a fresh portion of the crude tungstic acid is attacked, and the mass, from being pasty, becomes very fluid, but not transparent. When this saline mass is exhausted with boiling water, the excess of nitre and a large quantity of a salt, which we shall call B, are removed. After these washings, there remains a residue insoluble in water so long as it is charged with nitre, but which immediately passes through the filter on being washed with pure water. This insoluble residue we shall call salt C.

We shall now proceed to examine the products thus separated.

Salt A.—The solution of A, left to itself, deposits the free nitre, if any be present, and on cooling congeals to a crystalline mass, which, according to the temperature and the degree of purity of the salt, presents the apparent characters of boracic acid, or those of the chlorate of potassa. What is most remarkable is, that these crystals are essentially composed of nitre, water, and a few thousandths of a salt of the tungstic group. When submitted to the action of boiling water, they are decomposed, and we obtain a solution of pure nitre and a flocculent deposit, which, after numerous washings with concentrated hydrochloric acid, forms a mealy powder, insoluble in those acids which have great affinity for water, and very soluble in water.

The solution, evaporated to dryness to expel the hydrochloric acid, leaves a yellowish white residue, which re-dissolves entirely in pure water, and furnishes a solution which possesses acid properties in the highest degree.

This acid A strongly reddens blue tincture of litmus; its solution does not precipitate the nitrate of silver; it is reduced by zinc, and passes into the state of an inferior oxide of the purest blue color. Lastly, on treatment with acids which have great affinity for water, this acid in solution parts with its hydrate water, and immediately regenerates the above-mentioned mealy powder. Under the air-pump, the solution of the acid A is soon converted into a yellow crystalline mass, like sulphur crystallised by fusion, or of a milk-white color, assuming the form of regular octohedra when the acid is purest.

Salt B.—The solution of this salt is composed of an excess of nitre and of tungstate of potassa, properly so called, from which may be prepared tungstic acid and its salts, which are easily obtained pure and of definite composition. They always furnish a yellow precipitate with protochloride of tin.

Insoluble Salt C.—This salt, heated to redness with twice its weight of caustic potassa, the fused mass being afterwards treated with water, furnishes an insoluble residue of peroxide of iron and a liquid, which, on the addition of a slight excess of nitric acid, yields by boiling a milky-white pulverulent precipitate, which is a distinct acid from the foregoing ones. Both in the free state and in all the compounds we have examined, this acid C cannot be treated with pure water without passing through the filter. In other respects it possesses most of the characters of tungstic acid, and like it is soluble in ammonia and the other caustic alkalis. It is attacked by the bisulphate of potassa, and is precipitated from its solutions by certain acids, reduced by hydrogen, passing into the state of blue oxide, gray oxide or metal. It differs, however, from tungstic acid by such distinct and permanent characters, that it is impossible to confound the two. Thus, for instance, its color passes, under the influence of heat, from white to yellow, returning to its primitive state on cooling. It is insoluble in hydrochloric acid under circumstances in which tungstic acid is readily soluble; and, on the contrary, dissolves in nitric acid, whilst tungstic acid under the same circumstances is perfectly insoluble in it. It appears to approximate to niobic acid in other properties, but differs by several important characters, which we shall describe when we have experimentally compared the two acids.

The three salts which we have isolated

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appear well-defined and distinct, but when mixed they react on each other so much as to cause important modifications in their respective properties; and these modifications vary according to the proportion in which they are mixed. This explains all the contradictory particularities in the history of the tungstates.—*Comptes Rendus*, Jan. 26, 1852.

ON SOME NEW COMBINATIONS OF COBALT.

BY M. ROGOJSKI.

M. CLAUDET has lately published, in the *Philosophical Magazine*, Oct. 1851, and since in the *Annales de Chimie et de Physique*, 3rd *Série*, t. xxxiii. p. 483, a memoir on some new ammoniacal combinations of cobalt—a memoir in which he mentions among others the existence of a chloride of a very extraordinary composition, without example in the series of known combinations.

At the invitation of M. Gerhardt, I undertook, in his laboratory, some experiments on the same subject, with the view of throwing light on the composition of this singular body, and also of seeking new facts which would enable us to ascertain its real nature.

In the course of these researches, I have discovered a new compound entirely different from that of M. Claudet, and which promises to throw some light on the problem which I seek to solve. It is a chloride analogous to the ammoniacal chlorides discovered by M. Reiset, or rather to the ammoniacal chlorides of the same metal discovered more recently by M. Gerhardt, and corresponding to the platinum salts. In fact, my new chloride belongs to the cobaltic salts, and not to the ordinary cobaltous salts. It crystallises in small tangled orange yellow prisms, very soluble in water, whereas M. Claudet's salt is obtained in small crimson octohedra, which are almost insoluble in that liquid.

According to several analyses, the new chloride contains

$$Co^2Cl^3, 3N^2H^6,$$

a formula which may be represented by

$$ClH, N^2H^5Co,$$

giving to Co the value of $\frac{2}{3}$ Co.

In fact, it is a hydrochlorate which gives, by double decomposition corresponding sulphate, nitrate, acetate, &c. A characteristic reaction of the same chloride is obtained with the bichloride of platinum. A mixture of solutions of the two salts produced, without heat, a yellow precipitate which might be taken for chloroplatinate of ammonia, but which is distinguishable from this salt by dissolving in hot water and crystallising, on cooling, in small prisms. This precipitate is the chloroplatinate of the base contained in my chloride: it contains

$$PtCl^2, ClH, N^2H^5Co.$$

This base, to which I give the name of *dicobaltinamine*, represents a double molecule of ammonia, in which 1 atom of hydrogen is replaced by its equivalent of *cobalticum*. It is exactly analogous to the bases obtained with platinum by MM. Gerhardt and Reiset, so as to present to us the following series:—

N^2H^5Pt, diplatosamine, NH^2Pt, platosamine.

$N^2H^4Pt^2$, diplatinamine, $NHPt^2$, platinamine.

N^2H^5Co, dicobaltinamine, NH^2Co, cobaltinamine (unknown).

I shall hasten to communicate to the Academy the complete results of my researches as soon as I have concluded them. I must likewise say, in conclusion, that my new base is not mentioned in the two notes recently communicated by M. Frémy.—*Comptes Rendus*, No. 5, Feb. 2, 1852.

CLAIM OF PRIORITY, ON THE OCCASION OF A RECENT COMMUNICATION OF M. BOUILHET.

BY M. DE RUOLZ.

THE attention of the Academy has been called by M. Bouilhet, to the reactions, which are produced during the preparations of solutions of silver, either in cyanide of potassium or the alkaline ferrocyanides, or ferrid-cyanides, (liquors used for galvanic plating). The theories of M. Bouilhet would upset completely those of all authors (Thenard, Dumas, Berzelius, Liebig, Graham etc.) before 1841, and since introduced into all treatises on Chemistry.

I have but recently received information of the memoir of M. Bouilhet. Without now discussing his theories, I must be permitted to claim for myself a right to priority as an historic point, independently of all theoretical application. The fact indicated for the first time by me is as follows:

Before 1841 it was known that certain compounds of silver were soluble in cyanide of potassium, and it was believed that the ferrocyanides and ferrid-cyanides could not have this property, because it was not known that at a certain temperature and under the influence of certain double affini-

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ties, iron, contrary to the general laws of the precipitation of metals one by the other, could be, in part, precipitated by the silver of its cyanuretted combinations. The proof of this state of the science, before me, results clearly from various passages in well known works, passages which I have appended to the end of my note, and to which I request the attention of the Academy.—*Comptes Rendus.* No. 7, February 16, 1852.

REPORT ON A MEMOIR OF M. HENRI BOUILHET ON THE DOUBLE CYANIDE OF POTASSIUM AND SILVER, AND ON THE EFFECT OF THIS SALT IN ELECTRO-CHEMICAL PLATING.

COMMISSIONERS, MM. THENARD, REGNAULT, AND PELOUZE, (REPORTER.)

"Cyanide of potassium put in contact with a salt of silver forms, by double decomposition, a precipitate of cyanide of silver which disappears entirely in an excess of the alkaline cyanide. The solution deposits, by evaporation, a double salt formed of equal equivalents of cyanide of potassium and cyanide of silver (KCy, AgCy.)

"The property possessed by this salt of serving as a silvering bath is due to the presence of the double salt which we have just mentioned.

"The ferrocyanide and ferrid-cyanide of potassium produce also with the salts of silver, solutions which are decomposed under the influence of the battery, in the same manner as the above mentioned liquor.

"It was important, with regard to the theory of electro-chemical plating, to compare with each other the principal operations by which it could be realised in manufacture, and to examine the mode of action of simple cyanide of potassium, the ferrocyanide and ferrid-cyanide of potassium, on the various salts of silver.

"Is the iron which does not exist in the materials constituting the silvering baths prepared with cyanide of potassium, in other cases an element essential to the success of the operation, as some chemists have thought, or is the presence of this metal, on the contrary, without any influence on the results? M. Bouilhet, who directs the plating and gilding works of M. Christofle, was placed in a better position than any one to study this question, and he appears to us to have decided it. He has proved that the silvering baths prepared either with ferrocyanide, or ferrid-cyanide of potassium contain precisely the same double salt produced, under similar circumstances, by the cyanide of potassium.

"M. Bouilhet has not, however, restricted himself to proving the presence of this salt in silvering baths and its property of silvering metals, under the influence of the battery; but proceeding by analytical examination, he has determined the exact quantity of cyanide of potassium and silver furnished, with an excess of cyanide of silver, by a known weight of either ferrocyanide or ferrid-cyanide of potassium, and has assured himself that from the first to the last crystallisation, the salt which is deposited by the solutions, consists exclusively of the double cyanide of potassium and silver.

"Thus 10 grammes of ferrocyanide of potassium (K^2FeCy^3), after a prolonged boiling with a slight excess of cyanide of silver, furnished to M Bouilhet 18·339 gr. of double cyanide of potassium and silver, instead of 18·820 as indicated by theory.

"One hundred parts of red prussiate (ferrid-cyanide of potassium $=Fe^2K^3Cy^6$) gave him 182·8 of it; and supposing that the 3 equivalents of potassium contained in this salt were united to 3 equivalents of cyanide of silver, 181·3 of double salts should have been obtained. It is thus seen that the result given by experiment is confounded, so to speak, with the theoretical number.

"To assure himself of the actual composition of the double cyanide of potassium and silver proceeding from the three sources in question, M. Bouilhet decomposed this salt by an excess of sulphuric acid, and calcined to redness the mixture, evaporated to dryness, until it lost no more in weight. The mixture of sulphates of potassa and silver resulting from this treatment having been dissolved in nitric acid, the proportion of sulphuric acid was determined in the state of sulphate of baryta, and the silver in the state of chloride. As for the potassium, that was appreciated by the difference. Another portion of the same substance was burned with the precautions necessary for the analysis of nitrogenous organic matters. This experiment gave the proportion of carbon and nitrogen, and thus, that of the cyanogen.

"These analyses, which M. Bouilhet has taken pains to multiply and verify in various ways, confirm the formula KCy, AgCy, assigned to the double cyanide of potassium and silver.

"The reaction in which this salt is formed is accompanied by a disengagement of prussic vapor and the formation of a precipitate, the nature of which it was necessary to appreciate: this study forms the completion of M. Bouilhet's work. We shall recapitu-

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late the principal results at which he has arrived and some of which have been long known.

"When a salt of silver is put in contact with ferrocyanide of potassium, a new salt is formed with a base of potassa and ferrocyanide of silver. The following equation offers an example of this decomposition:

$$2(AgO,\ NO^5)+FeK^2Cy^3=2(KO,\ NO^5)+FeAg^2Cy^3.$$

"The ferrocyanide of silver, which is very unstable, is quickly decomposed into protocyanide of iron and cyanide of silver.

"The cyanide of silver in its turn decomposes the ferrocyanide of potassium according to the following equation:

$$2(AgCy)+FeK^2Cy^3=FeCy+2(AgCy,KCy)$$

"By analysing this decomposition, which is realised in two different phases, we see that 2 equivalents of a salt of silver, the nitrate for example, act upon 2 equivalents of yellow salt to produce 2 equivalents of protocyanide of iron and 2 equivalents of double cyanide of potassium and silver:

$$2(AgO,\ NO^5)+2(Fe\ K^2Cy^3)=2(FeCy)+2(AgCy,\ KCy)+2(KO,\ NO^5).$$

"By operating out of contact wtth the air, the precipitate of cyanide of iron which is formed presents the color and characteristics of protocyanide of iron, and particularly that of becoming blue in contact with oxygen and chlorine water.

"An exactly analogous reaction takes place when ferrid-cyanide is snbstituted for ferrocyanide of potassium; only the precipitate of cyanide of iron is of a greenish blue color, instead of a greyish white, and a prolonged boiling changes it completely into hydrate of sesqui-oxide of iron of brick red color. This last transformation is easily explained; the sesquicyanide of iron, by decomposing the water, produces peroxide of iron and hydrocyanic acid which the author has easily collected and the odor of which is very evident during the whole course of the reaction.

"In conclusion, the salts of silver produce with the red salt of potassium a precipitate of ferrid-cyanide of silver:

$$3(AgO,\ NO^5)+Fe^2K^3Cy^6=3(KO,\ NO^5)+Fe^2Ag^3Cy^6.$$

"This last decomposes in the second place into sesqnicyanide of iron Fe^2Cy^3 and cyanide of silver:

$$Fe^2Ag^3Cy^6=Fe^2Cy^3+3(AgCy).$$

"Cyanide of silver acts in its turn on the ferrid-cyanide of potassium, according to the following equation:

$$3AgCy+Fe^2K^3Cy^6=Fe^2Cy^3+3(KCy,\ AgCy).$$

"The reciprocal affinity of cyanide of potassium and cyanide of silver is not manifested only in the reactions we have just analysed: M. Bouilhet mentions in his memoir, a very curious experiment of Messrs. Glassford and Napier, which shows the energy with which cyanide of potassium substitutes itself for the body in union with the silver to produce the double salt so often mentioned in this Report.

"When 4 equivalents of cyanide of potassium are put in contact with 1 equivalent of ferrocyanide of silver, 2 equivalents of double cyanide of potassium and silver are formed, and 1 equivalent of ferrocyanamide of potassium:

$$4KCy+FeAg^2Cy^3=2(KCy,\ AgCy)+FeK^2Cy^3.$$

"This decomposition is so easy and so clear, that Messrs. Glassford and Napier, and after them, M. Bouilhet have been able to recover within 1 per cent. of all the ferrocyanide of potassium used to precipitate the silver.

"Finally, to terminate what is relative to the very delicate question of the nature of the bodies resulting from the respective action of the cyanides and ferrocyanides on the salt of silver, we will add that if the cyanide of silver is made to act directly on the ferrocyanide of potassium, the solution becomes immediately alkaline by the elimination of a certain quantity of cyanide of potassium:

$$2AgCy+FeK^2Cy^3=2KCy+FeAg^2Cy^3.$$

"After a prolonged ebullition, the ferrocyanide of silver is decomposed into cyanide of iron, and cyanide of silver which unite with the cyanide of potassium, to produce 2 equivalents of the double salt KCy, AgCy.

"Before the experiments of which we have just presented a summary analysis, the theory of plating was undiscovered, for no one knew the form under which the silver is found in the various mixtures of which the prussiates form a part: in showing that the double cyanide of potassium and silver is the the only compound of silver formed in these reactions, M. Bouilhet has been led to a very simple explanation of the phenomena connected with it.

"His theory, founded on positive facts, shows, in the clearest manner, that the agent which produces the silvering is always the same, whatever be the prussiate used, whether it be a simple alkaline cyanide, a ferrocyanide, or ferrid-cyanide.

"In arriving at this important conclusion, M. Bouilhet must have overcome many difficulties, and he has certainly given proofs of perseverance and skill; therefore, your Commissioners do not hesitate to ask from the Academy that it will kindly order the

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insertion of the Memoir of the Author in the Recueil des Savants étrangers."

The conclusions of this report were adopted.—*Comptes Rendus*, No. 6, February 9th, 1852.

ON A NEW SOURCE FOR OBTAINING CAPRIC ACID, AND REMARKS ON SOME OF ITS SALTS.

BY T. H. ROWNEY.

CAPRIC ACID has been obtained from various sources. Chevreul and Lerch discovered it in the butter of the cow and goat; Redtenbacher, among the volatile oily acids which he obtained by acting upon oleic acid with nitric acid; Gerhardt and Cahours produced it by the action of nitric acid upon oil of rue; and Görgey found it in cocoa-nut oil. From all these sources, however, it has been obtained in small quantity only, and always mixed with other acids of the same series.

The new source from which Mr. Rowney has obtained this acid is the fusel-oil or grain-oil, of the Scotch distilleries. This oil cheifly consists of water, alcohol, and the hydrated oxide of amyl, in various proportions, but sometimes contains small quantities of other constituents: Thus, œnanthic ether was found in it by Mulder, and margaric acid by Kolbe. The oil examined by Mr. Rowney was found to contain capric acid, probably in combination with oxide of amyl.

On subjecting the grain-oil to fractional distillation, the first portions which passed over consisted chiefly of water and alcohol, with a little hydrated oxide of amyl; the second portion was composed of the latter substance nearly pure; and a dark-colored residue was left, which had a disagreeable odor, was insoluble in water and carbonate of potash, but was rendered soluble in water by boiling with a strong solution of caustic potash, amylic alcohol being at the same time given off. Digestion for two or three days on a sand-bath with strong solution of potash, likewise renders the oil soluble in water. On adding hydrochloric or sulphuric acid to the cold alkaline solution, a dark oily mass consisting of impure capric acid rises to the surface. To purify this product it was dissolved in dilute ammonia, after filtering and washing with cold water; the solution mixed with chloride of barium: the resulting precipitate filtered and washed with cold water; afterwards dissolved by boiling water; and the solution filtered whilst hot, and then left to crystallise. The baryta-salt thus obtained was purified by two or three crystallisations, then decomposed by carbonate of soda, and dilute sulphuric acid added to the filtrate to separate the capric acid. The product was solid and nearly colorless; but to obtain it perfectly pure, it was dissolved in alcohol, and the solution mixed with a large quantity of water, whereupon it became turbid, and after some hours deposited capric acid in the crystalline state. By repeating this process, the acid was obtained quite pure and colorless. The mother-liquors from the baryta-salt yielded a further portion of capric acid, together with an oily acid, the quantity of which was, however, too small to allow of its constitution being determined.

Capric acid thus obtained is a solid white, crystalline compound, which has a faint odor, and fuses readily between the fingers. It is very soluble in ether and alcohol, and does not crystallise from these solutions. It is insoluble in cold water, but dissolves sparingly in boiling water, and crystallises from the solution on cooling in the form of scales. It is also dissolved without decomposition by strong boiling nitric acid, and is precipitated from the solution by water. From the alcoholic solution it is obtained by the addition of water, in a mass of needle-shaped crystals. It is lighter than water. The crystallised acid begins to fuse at 81° F., but the temperature rises to 116° before the fusion is complete. The fused acid is slightly colored, has a faint odor, and becomes crystalline on cooling. The crystallised acid, dried *in vacuo*, gave by analysis results agreeing with the formula $C^{20}H^{20}O^4$.

Caprate of silver, $C^{20}H^{19}AgO^4$, is obtained by adding nitrate of silver to an ammoniacal solution of capric acid. It is insoluble in cold water, sparingly soluble in boiling water, and is deposited from the solution, in needle-shaped crystals on cooling. It is more soluble in boiling alcohol; but the solution becomes dark-colored, and the crystals obtained from it are also dark-colored. It is very soluble in ammonia, and if the ammoniacal solution be kept in a warm place, so as to drive off the ammonia, a crystalline salt is obtained. Caprate of silver blackens rapidly, if exposed to bright daylight while moist, but after drying, the light no longer affects it.

Caprate of baryta $C^{20}H^{19}BaO^4$, is obtained by adding chloride of barium to an ammoniacal solution of capric acid. It is soluble both in water and in alcohol at the boiling-points, and crystallises out, on cooling, in needle-shaped crystals. This salt, as well as the salts of the other alkaline earths, and the silver-salt, are insoluble in

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water after having been dried, because they float on the surface of the water and repel it; but if first moistened with alcohol, they may be again rendered soluble in boiling water. They are also very difficult to pulverise.

The *Caprates of lime* and *magnesia* are similar to the baryta-salt, but more soluble in alcohol and boiling water. The quantity of base in the magnesia-salt agrees with the formula $C^{20}H^{19}MgO^4$; the lime-salt was not analysed.

The other salts of capric acid do not crystallise readily. The copper-salt is insoluble in water and alcohol, but soluble in ammonia. The lead-salt is insoluble in water, and very sparingly soluble in boiling alcohol, which deposits it in rounded grains on cooling. The soda-salt is exceedingly soluble both in water and alcohol, and does not crystallise from these solutions; when evaporated to dryness, it forms a hairy mass, partially crystalline on the surface. None of these salts could be obtained in a state of purity, and their analyses gave an excess of base; but the copper and soda-salts appear to be neutral.

Capric ether was obtained by dissolving the capric acid in absolute alcohol, passing dry hydrochloric acid gas into the solution to saturation, and then adding water, which caused the capric ether to rise to the surface in the form of an oily liquid. After washing with cold water, and drying with chloride of calcium, it had a density of 0·862. It is insoluble in cold water, but readily soluble in alcohol and ether. The quantity obtained was too small for analysis.

Capramide.—The capric ether was converted into this compound by solution in alcohol and long-continued digestion in a stoppered bottle with strong ammonia. After a few days, the solution became turbid, and subsequently crystals made their appearance. The digestion was continued till the whole of the ether had disappeared, after which the solution was separated from the crystals by filtration; the filtrate evaporated to dryness over the water-bath; the residue dissolved in alcohol; and the solution mixed with water, which caused the capramide to crystallise; the whole was then dissolved in warm dilute alcohol, and allowed to crystallise. Capramide thus obtained is quite colorless, and crystallises in brilliant scales, which, when dry have a bright silvery lustre. It fuses below 212°, is insoluble in water and ammonia, very soluble in cold alcohol, and also in dilute alcohol when warmed with it. Analysis gave results in accordance with the formula $C^{20}H^{21}O^2N$.—*Trans. Roy. Soc. Edinb.* XX, 219.

INTRODUCTION TO THE STUDY OF CHEMISTRY.

No. VIII.

VI. Hydrogen. H. 1.

This gas exists in great abundance in nature as an element of water and of animal and vegetable substances. It was first properly examined in a state of purity, in 1766, by Cavendish. Before his time, under the name of inflammable air, it had been confounded with several of its own compounds. Its name is derived from ὑδωρ, *water*, and γεννᾶειν, to generate, from its being one of the constituents of water.

Hydrogen may be produced by treating iron or zinc with dilute sulphuric acid. A few pieces of iron or zinc may be introduced into a flask, and sufficient sulphuric acid diluted with six or eight times its bulk of water, to cover the fragments of metal added; a glass tube, inserted in a perforated cork is then fixed in the flask; effervescence follows, accompanied by evolution of heat; the gas passes out through the tube and may be collected in a jar by means of the pneumatic trough. The formula of the reaction which occurs in this case is:—

$$SO^3HO+Zn=SO^3ZnO+H.$$

Hydrogen obtained in this way is never quite pure. When iron is used in its preparation, it has a peculiar and disagreeable odor which Berzelius attributes to its containing a volatile oil, produced by its combination with a very small proportion of carbon, which all common kinds of iron contain. On passing the gas obtained by means of iron into alcohol, the latter absorbs much of its odor, and becomes turbid by the addition of water. It is rather more pure when obtained by means of commercial zinc; but even then it contains a trace of zinc and carbon, and sometimes sulphur and arsenic. When it is desired to obtain hydrogen in the perfectly pure state, this gas must be generated by means of pure sulphuric acid so diluted as to act slowly on the metal and purified zinc, passed through a solution of potassa, and dried by being driven through a tube containing pieces of fused chloride of calcium, and collected over mercury. Hydrogen disengaged from water by means of the decomposing power of voltaic electricity and carefully dried, may be regarded as pure. It may also be obtained by the action of an amalgam of potassium or sodium, on pure water, with the oxygen of which these metals combine, liberating hydrogen, which may be collected.

These methods are, however, too expensive to be applicable to ordinary purposes.

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Many metals, possessing a powerful affinity for oxygen, are, however, unable to take it from its combination with hydrogen; but the decomposition readily takes place at a red heat; iron is frequently employed for this purpose, and in the following manner: an iron tube is loosely filled with iron turnings or borings, or pieces of coiled iron wire, placed horizontally in a furnace and powerfully heated; a glass retort containing water is connected with one end of the tube, and a flexible tube to the other, and passing under the shelf of the pneumatic trough. The water in the retort is made to boil, and the steam passes into the iron tube, and coming in contact with the particles of red hot iron, decomposition immediately ensues, the iron is oxidised and hydrogen gas is copiously disengaged.

Hydrogen is an uncondensable gas; it is not absorbed by water, unless the latter has been boiled for a long time to deprive it of common air; it is colorless, tasteless, and, when perfectly pure, inodorous; it refracts light powerfully. Its capacity for heat exceeds that of all other gases, being 21·9 by Dr. Apjohn's experiments, air being 1·00, for equal weights, or 1·46 for equal bulks. It is the lightest form of matter known; its equivalent, or atomic weight, is lower than that of all other substances; it is, therefore, taken as unity with regard to the atomic weights of all other bodies. Its extreme lightness renders it very difficult to ascertain its weight with accuracy; the researches of Dulong and Berzelius and of Dr. Prout, lead to the inference that its specific gravity, compared with oxygen, is as 1 to 16, consequently, 100 cubic inches of pure hydrogen at common temperature and pressure, weigh only 2·1483 grains; its specific gravity, compared with that of atmospheric air (taken at 1000-0) is 69·3. At 32° F., 100 cubic inches weigh 2·22756 grains (Thomson).

The lightness and inflammability of hydrogen gas may be exhibited in an amusing manner by forming soap bubbles with it, which ascend rapidly, and may be inflamed by the application of a lighted paper. Hydrogen extinguishes a lighted taper immersed in it.

Cavendish, in investigating the quantity of atmospheric air requisite for producing an explosive mixture with hydrogen, ascertained that the loudest explosion was produced by a mixture of 1 volume of hydrogen gas with 3 volumes of atmospheric air. A mixture in the proportions of 1 volume of the former to 9 volumes of the latter burned very weakly, and four of hydrogen with one of air burned without explosion.

When two volumes of hydrogen, mixed with one of oxygen, are inflamed in the electrical air gun, or in a small, strong phial, the explosion is exceedingly violent; if, however, the mixture be diluted with eight volumes of hydrogen or nine of oxygen, no explosion occurs.

Hydrogen, in burning, forms water. It is capable of entering into combination with oxygen and forming water, without any explosion or apparent combustion. When a mixture of the gases is passed through a tube heated to scarcely perceptible redness, they combine without noise; this effect may be produced at a much lower temperature, when some sand or coarsely powdered glass is placed in the tube; slips of gold and silver favor the reaction still more; but platinum produces the effect most expeditiously, even at the ordinary temperature. This effect is apparently produced by the metallic surface retaining a thin layer of gas with such force as to bring the molecules by condensation within the sphere of their reciprocal chemical attractions; on combining they form water, and a fresh portion of the mixed gases comes into contact with the platinum, and the same effect occurs. If the substance called spongy platinum, in which the acting surface is of very considerable extent, be used instead of the metal itself, the combination takes place with such rapidity that the heat produced raises the temperature of the ball of platinum to bright redness, and the remaining gas explodes. Spongy platinum instantly explodes a mixture of hydrogen and oxygen. The heat produced by the combustion of these two gases is the most powerful that can be artificially obtained; for this reason it is used in the apparatus called the oxy-hydrogen blow-pipe.

When a current of hydrogen issuing from a tube with a very small bore is inflamed, and a tube of 18 or 20 inches long is held in the flame, a peculiar musical sound is produced, which varies in pitch with the length and bore of the tube, and the extent to which the flame, which ought to be very small, enters into the tube. This phenomenon, although best produced by hydrogen, is not peculiar to it, but is likewise caused by many other flames; it is due to the regular succession of little explosions, and consequent vibration, resulting from the combustion of the gas in the tube.

The dispositions of gases to mix with each other, under all circumstances, and to penetrate into the volume of each other, is clearly shown when hydrogen is one of the gases employed. If we connect perpendi-

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cularly by means of a long glass tube of small bore, two small phials, one containing oxygen, and the other hydrogen, after a few hours, although the hydrogen is uppermost, and much lighter than oxygen, it will be found to have completely mixed with the oxygen; and the gases will be found in equal proportions in each phial. This fact has given rise to the opinion that one gas acts as a vacuum to another.

Hydrogen passes with remarkable facility through the most minute fissures, crevices, and capillary tubes, through membranes and other organic tissues. A curious observation of Doebereiner, of the escape of hydrogen through a small crack in a glass jar, which he had filled with that gas, and placed on the shelf of the pneumatic apparatus, first attracted notice to this subject: he found that the water had risen in the jar nearly three inches above the level of the same liquid in the trough. Professor Graham subsequently investigated this subject. The following abstract of his inquiries, which are more fully developed in his *Elements of Chemistry*, is taken from Professor Brande's *Manual*:—

"On examining Doebereiner's result, he found, whilst the hydrogen escaped outwards a portion of air penetrated inwards, amounting to between one-fourth and one-fifth of the volume of the lost hydrogen; that, in fact, when hydrogen communicates with air by such a chink, there is a powerful disposition to mutual intermixture; 'a particle of air, however, does not interchange with a particle of hydrogen of the same magnitude, but of 3·83 times its magnitude. We may adopt the word diffusion-volume, to express this diversity of disposition in gases to interchange particles, and say that the diffusion-volume of air being=1, that of hydrogen gas is=3·83. Now, every gas has a diffusion-volume peculiar to itself, and depending upon its specific gravity; of those gases which are lighter than air, the diffusion-volume is greater than 1, and of those which are heavier, the diffusion-volume is less than 1.'"

These results were obtained by Professor Graham by means of a diffusion-tube, which is a graduated glass tube, about half an inch in diameter, and fourteen inches in length; it is stopped at one end with a plug of plaster of Paris of about $\frac{1}{3}$ of an inch in thickness, and may be used over water or mercury, but care must be taken, in filling it, not to wet the plug. This diffusion-tube should be filled with the gas, by propulsion from a jet into the tube, thus completely dislodging the atmospheric air without wetting the plug, and then removed to a vessel containing water; the gas then passes through the pores of the plaster plug into the atmosphere, and the water rises in a proportionate degree into the tube, and in a short time it will be found that the whole of the hydrogen has made its escape, its place being now occupied by an equivalent quantity of atmospheric air. It is necessary in these experiments to guard against inequality of pressure by placing the diffusion-tube in a vessel of water, which must be added to as it rises in the tube; both levels must be kept equal. The diffusing power of air being=1; that of hydrogen is=3·8; that of oxygen=0·9; and that of nitrogen=1·014.

Other porous substances, such as cork, or spongy platinum, may be used for stopping the diffusion-tube, instead of plaster of Paris; a piece of bladder, or thin caoutchouc, may also be sometimes employed. When caoutchouc is used, a very pretty experiment, illustrating this form of endosmose and exosmose, may be performed in the following manner:—A tumbler or glass vessel having a rim, containing atmospheric air is tied over with a piece of very thin sheet-caoutchouc, and placed under a large bell-glass filled with hydrogen, standing in a shallow vessel containing water; the hydrogen will, by degrees, pass through the caoutchouc and distend it so powerfully as to cause it to assume a globular appearance over the top of the glass vessel, or even ultimately burst it; when the inner vessel is filled with hydrogen, and the outer one with common air, the effects are inverted; and the caoutchouc covering is forcibly depressed into the inner vessel, instead of rising in a globular form above it.

With regard to the nature of hydrogen, Sir Robert Kane, in his Elements of Chemistry, expresses himself as follows; we may, however, observe, that this is not by any means so settled a question as might be inferred from his remarks:—

"In its relation to other bodies, hydrogen plays a very remarkable and peculiar part. It was at one time supposed that it shared with oxygen, the power of generating acids, and as sulphur, chlorine, cyanogen, iodine, &c., form one class of acids by combining with oxygen, so they formed a second class, called hydracids, by entering into union with hydrogen, and hydrogen was believed to be related to hydrochloric acid, as oxygen was to the sulphuric or the phosphoric acid. I have, however, long since, proved this view to be totally incorrect, and that all the properties of the compounds of hydrogen combined to

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show that it was eminently an electro-positive body; that it took a place along with iron, manganese, and zinc, and that the compounds of hydrogen with chlorine, oxygen, iodine, and sulphur, were almost universally electro-positive in combination, and possessed basic characters derived from the pre-eminent positive energies of the hydrogen itself. These views have, since that period, been still further corroborated by the researches of Graham, and by additional investigations of my own; and although the old and familiar nomenclature will still retain its place to a great extent, yet there rests now no doubt upon the minds of philosophical chemists, that hydrogen is most closely allied to the metals, particularly to zinc and copper; that the chlorides, iodides, and fluorides of hydrogen, although they simulate some of the characters which we assign to acids, resemble in all important points the chlorides, iodides, &c., of the metals above-mentioned; that, in fact, hydrogen is a metal enormously volatile, standing probably in the same relation to mercury that mercury does to platinum in that respect, but still possessed of all truly chemical properties of the metallic state, and no more deprived of the common-place qualities of lustre, hardness, or brilliancy, than is the mercurial atmosphere which fills the apparently empty top of the tube of the barometer, or the salivating atmosphere of a quick-silver mine, or of a gilder's shop."

In our next we shall describe the compounds of hydrogen, commencing with water.

ON ELECTRO-CHEMICAL PLATING, IN ANSWER TO M. DE RUOLZ.

BY M. BOUILHET.

At the last sitting, M. de Ruolz contradicted the conclusions of a memoir which I had the honor to submit to the Academy, and on which a Commission, through M. Pelouze had made a favorable Report.

In his note he, in the first place, claims a right of priority for having been the first to announce in 1841, that, to use his own words, "contrary to the general laws of the precipitation of metals one by the other, iron could be, in part, precipitated by the silver of its cyanuretted combinations."

Then, pretending that it is simply with the aid of formulæ that I have been able to show the identity of the solutions of silver in the three prusiates, he announces that he will submit to the Academy some facts of a nature to contradict my theory.

To these facts I shall content myself by replying:

1st, That in 1840, although the Treatises on Chemistry did not mention it, it was known that the salts of silver, would dissolve in the yellow prussiate, since on the 29th of September of that year Mr. Elkington mentioned it in a patent, by determining the necessary and sufficient condition, namely, boiling.

2nd. That Mr Elkington, in 1840, and after him, M. de Ruolz, in 1841 only looked at this fact from an industrial point of view, and I do not know that any one, before me has discovered that it is the double cyanide of potassium and silver, CyK, CyAg, which is the compound of silver which results from the reaction of the salts of this metal on the three prussiates; that, moreover, it is not merely formulæ, but chemical analysis, which proved to me the presence of this salt;

3rd. That neither in its acid solutions, nor in its cyanuretted solutions does silver precipitate iron; because, for example, if cyanide of silver be put with ferrocyanide of potassium, there are formed ferrocyanide of silver and a salt of potassium which is the simple cyanide, as has been shown by M. Gay-Lussac.

Now the ferrocyanide of silver is a very unstable white precipitate, which becomes blue in the air.

Under the influence of ebullition, it is decomposed into protocyanide of iron and cyanide of silver which then combines with the simple cyanide of potassium which has been set at liberty.

4th. M. de Ruolz says, in his note, that my experiments upset all theories and especially those of MM. Dumas, Thenard, Berzelius, Liebig, Graham, etc.; the approbation given by some of these learned chemists to my memoir, replies to this singular assertion.

M. de Ruolz announces an early memoir on the facts produced by the preparation and decomposition of silvering baths by the battery. It will be understood that we are not bound to reply to experiments that are not yet made.

But as the Academy has done us the signal honor of ordering the insertion of our first work in the *Recueil des Savants étrangers*, it is our duty to continue our researches, and we shall also, on our side, submit a new memoir to the judgment of the Academy.—*Comptes Rendus*, No. 8, February 25, 1852.

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RESEARCHES ON THE DECOLORING POWER OF CHARCOAL AND SEVERAL OTHER BODIES.

BY M. E. FILHOL.

It is generally said that charcoal is the only simple body which possesses the property of absorbing coloring matters dissolved in a liquid: it results moreover, from the labors of MM. Bussy and Payen that decoloration by charcoal is a purely physical phenomenon, a phenomenon of dyeing. Several compound bodies, (alumina, sulphuret of lead prepared by the humid way, and hydrate of lead) also possess the property of decoloring liquids; but chemists for the most part, regard the action which the oxides exert on coloring matters in the preparation of lakes as a chemical action, different from that of charcoal; however, Berzelius thought he might compare the decoloration by the oxides and the metallic salts with that produced by charcoal.

In the work which I now submit to the judgment of the Academy, it has been my object to prove:

1. That charcoal is not the only simple body which possesses the property of decoloring liquids: sulphur, arsenic, and iron resulting from the reduction of the hydrated sesquioxide by hydrogen, have appreciable decoloring powers.

2. That the number of compound bodies endowed with an appreciable decoloring power is much greater than has been supposed, and that this property seems to depend much more on the state of division of these bodies than on their chemical qualities:

3. That a certain body which easily appropriates one coloring matter, may have very little tendency to remove another; thus, bone phosphate of lime (artificially obtained) with difficulty decolors a solution of sulphindigolate of soda, whilst it acts on tincture of litmus more energetically than animalblack.

4. That the decoloration is, in the great majority of cases, a purely physical phenomenon; thus, the same coloring matter is absorbed by metalloids, metals, acids, bases, salts and organic substances: besides it is easy, by employing suitable solvents, to procure the color unaltered from the body by which it had been absorbed.

I do not doubt that these practical data will become the subject of useful applications in chemical analyses and industry.

The following results which, I extract from my memoir, may give an idea of the energy with which some decoloring matters act.

My observations were made with the aid of the calorimeter with a double burette of Collardeau.

Decoloring power compared with that of Animal Charcoal washed with hydrochloric acid supposed equal to 100.

	Tincture of Litmus.	Sulphindigolate of soda.
Charcoal	100	100
Pure hydrate of iron	128·90	1·97
Alumina	116·	9·91
Phosphate of lime	109	1·97
Iron reduced by hydrogen	95·33	100
Sulphur (magistre of)	26·67	0
Binoxide of manganese (native)	88·90	13·80
Indigo	80·	13·50
Oxide of zinc	80	6·55
Stannic acid	70·40	0
Antimonic acid	66·66	1·97
Chromate of lead	70·40	2·92
Litharge	66·66	3·85
Suphuret of antimony (native)	59·25	0
Sulphate of lead	50·	13·80
Binoxide of copper	26·67	0
Protochloride of mercury	22·22	0
Sulphate of baryta (artificial)	50	0
Sulphuret of lead (artificial)	130	16·67

Comptes Rendus, No. 7, 16 February, 1852.

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ON DRINKABLE WATERS IN GENERAL.

BY M. MARCHAED OF PÉCAMP.

1. The physical and chemical constitution of waters varies every day of the year, and every instant of the day.

2. When the temperature is the highest, the density of the water is also the most considerable, a sudden variation in the temperature causes likewise one in this density.

3. This physical property of water is also influenced by atmospheric pressure, but in inverse ratio to that caused by the preceding influence. The greater the pressure, the weaker the intensity. Nevertheless, when an augmentation of pressure corresponds to an elevation of temperature, the density is very often still farther augmented.

4. The variation of the proportion of the gaseous principles dissolved by waters not only causes modifications in their density, for the saline and earthy principles which they hold in solution vary equally in their proportions under the influences which I am about to mention.

5. The waters of the Ocean contain chloride of lithium and 0·0092 gramme of iodide of sodium per quart; but they contain no trace of nitrate, although these salts are poured in abundance into the sea by the currents of fresh water which flow into it.

The cause of this singular phenomenon is due to two different actions which take place simultaneously: 1st, under the reductive action of sulphuretted hydrogen excreted by certain mollusca existing in the depths of the Ocean, the nitric acid of these salts is transformed into ammonia and water; 2nd, under the influence of the respiratory act of the fish, an analogous phenomenon is manifested likewise giving as a final result an ammoniacal product; the ammoniacal oxide, formed in these circumstances, eliminated in its turn from the water, under the form of ammoniaco-magnesian phosphate, which is found again in the muddy deposits which accumulate at the bottom of the sea and on the sides of rivers.

6. Rain and snow waters generally contain appreciable traces of all the mineralising agents of the waters of the Ocean. The former retain always some indications of sulphuretted hydrogen.

7. The waters of the anti-diluvian soils generally contain lithia, and probably also phosphates as well as fluorides proceeding from the decomposition of mica, more or less abundant traces of which will be found in all these soils.

8. The waters which arise among calcareous soils always contain appreciable traces of ferruginous carbonates often accompanied by carbonate of magnesia.

9. Iodine and bromine are found also, except in some peculiar circumstances which I am about to mention, *in all natural waters*. We can easily and rapidly recognise their presence, even in rain and snow water.

10. These two principles may disappear from water by passing in a saline state, under the influence of the vital forces into the number of the mineral principles fixed by vegetables. Terrestrial plants, but particularly forest trees, as well as fresh water plants, contain iodine and bromine.

11. The origin of these two bodies in atmospheric and terrestrial waters should be attributed above all to the diffusion of these same principles, now condensed, in sea water, whence they are carried off, some in the saline state by the vapors and aqueous particles which perpetually escape from it, as well as in the state of free hydrated acids with sulphuretted hydrogen, which also exhale from it.

12. The endemicity of goïtre and cretinism should not be attributed to the use of calcareous, magnesian or selenious drinks, but solely to the more or less complete disappearance of the iodine, originally dissolved in the water which the persons affected with goïtre and cretinism use for their alimentation,—this principle having been absorbed by the numerous vegetables which these waters have bathed. The enlargement of the thyroïd gland is not manifested as an endemic, excepting in very wooded countries, and particularly in those whose drinkable waters wash or have washed a great number of plants.

13. That in populous cities, the watering of streets and public places during times of choleraïc epidemics should be severely prohibited, as well as the flowing of public or private fountains into rivulets or in open places.

14. That the waters of springs and rivers are purified by flowing on the surface of the soil, by the volatilisation of the carbonic acid, which allows the insoluble carbonates to separate; by the influence of vegetative life; by the vivification, under the influence of the luminous rays, of the organised matters which they contain; finally, by the successive decomposition of these same matters which decompositions then take place by causing also the reduction of the nitrates of the fresh waters, and their conversion into ammonia.

15. That in calcareous soils at least, but

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probably in all, the volume of the water from springs, contrary to the received opinion, is all the more abundant as the vegetation is more active, and that it decreases in amount in proportion as vegetable life becomes extinct, above all, in countries where the superior soil is entirely devoted to agriculture. In our countries the springs attain their *maximum* in quantity about the 15th August, and they sink to their *minimum* about the end of January.

16. Then proceeding to the natural waters of the Arrondissements of Havre and Yvetot, I deduce from their analysis that all these waters which, without exception, arise in calcareous soils, contain especially carbonate of lime, the proportion of which varies between 0·153 gr. and 0·381 gr. per quart, salts of magnesia, sulphate of lime, but in variable proportion and corresponding to the nature of the soils which produce them, so that the alimentary waters of the agglomeration of Havre are, with those of the wells of Fécamp, the most selenious in the country, which is, moreover, explained when we know that they issue from the inferior soils of the secondary formation, whereas all the other waters in the country have their sources in the superior stage of the chalk, or at the verge of the chalk glauconies.

All these waters contain likewise nitrate of lime, the proportions of which, varying between 0·00081 gr. and 0·22625 gr., become more considerable in those which flow from the inferior soils of glauconious formation.

Finally, all these waters contain appreciable traces of salt and manganese, salts of potassa and lithium, iodine and bromine, phosphate of alumina, and perhaps, I believe, even indications of *fluoride of calcium*.—*Répertoire de Pharmacie*, February, 1852.

II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

ON THE REFUSE ANIMAL CHARCOAL OF SUGAR-REFINING, ITS NATURE, ITS MODE OF ACTION ON VEGETABLES, ITS EMPLOYMENT IN AGRICULTURE, AND ON THE ECONOMICAL ADVANTAGES WHICH SHOULD RESULT FROM THAT EMPLOYMENT.

BY M. A. DE ROMANET.

From the various observations contained in this Memoir, I think, says the author, in concluding a memoir with the above title, that the theory of the mode in which the residual animal charcoal of sugar-refining acts on vegetation may be deduced.

Firstly, the charcoal produces no perceptible effect on old lands; therefore it does not contain in itself all the constituent elements of the alimentary plants which we cultivate. Indeed the vegetable detritus which are found in such abundance in new soils are completely wanting in those which are worn out. Then stable dung is suitable to the latter, because, being composed in great part of wheat straw, and other vegetable remains, united with a certain quantity of animal dejections, it presents more completely, although less powerfully, the elements indispensable to the nourishment of cereals and almost all crops.

Secondly, if, when animal charcoal is employed as manure, the same cereal may be sown in one spot for nine years in succession, without any diminution in the products being observed, it is because this earth contains a superabundant quantity of eminently fertilising vegetable detritus, and because it is sufficient to obtain fine products, to furnish to it matters of a different nature which are wanting, and which cereals require; but, at the same time, the application of the manure must be renewed every year, because these principles, furnished by the animal charcoal, are, for the most part, so easily assimilable, that they are immediately absorbed, and that very little of them remains in the soil when the wheat has accomplished its period of vegetation.

Thirdly, these new earths would produce, with ordinary dung, and without the assistance of animal charcoal, abundant crops, if only, after the grubbing up and division of their parts, a sufficient time be allowed to elapse to permit the atmospheric air to deposit in the ground certain nutritive elements indispensable to the vegetation of alimentary plants; then, by furnishing instantaneously to this incomplete, but rich soil, the matters which it does not yet possess, the charcoal does but advance and increase the slow and regular action of the meteorological agents, of which the air is the vehicle, especially the action of rain, which incessantly carries ammonia into the soil, but sparingly, whilst the albumen of the blood contained in the animal charcoal of the sugar houses disen-

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gages ammonia, on the contrary, in great abundance, on being decomposed in the earth.

Fourthly, animal charcoal causes us to obtain cereals on new or common lands, which, without its assistance, would produce, when first grubbed up, only furze, carex, rushes, and other plants not very fit for the nourishment of animals; then, on the other hand, it suffices to render the furze land capable of producing fine crops of cereals, with the sole aid of ordinary manures, that it shall receive one, or perhaps two applications of animal charcoal; therefore, the charcoal neutralises certain principles with which soils of this kind are impregnated, designated from time immemorial by the agriculturists of the centre of France under the very remarkable denomination of bitter soils,—principles which are as injurious to the culture of alimentary plants as they are favorable to the vegetation of rushes, furze, and other such plants.

But what are these bitter principles? Many authors, and particularly M. Chevreul, have noticed the existence of tannin or tannic acid in turf and furze earth; but none of these authors point out what occurs in this case. To find the solution of this question, it must be kept in view that the presence of a preservative agent can alone explain the accumulation, during several centuries, of the vegetable detritus which compose furze earth and turf: it is known that all marshes do not contain turf, and that soils which are covered with furze do not all contain furze earth, any more than all churchyards contain the bodies which have been buried in them, as they are kept in the church-yard of St. Michael at Bordeaux, and the lower chapel of the convent of Kreitzberg, near Bonn. Every one has seen, particularly in the Gatinais, in Maine, &c., vast surfaces which are covered with furze, and when this furze is pulled up, a whitish soil is found, not containing a particle of vegetable remains.

The slow and progressive accumulation of the organised bodies, of which turf and furze earth are composed, therefore necessarily indicate a peculiar constitution of the soil, and show, in this soil, the presence of a special agent, of an agent so powerful, that in Sologue, where the furze often covers, as in many other countries, the soil where trees have been cut down, I have seen many times, in woods, carefully enclosed, and kept from pasture since they had been cut, sheeps' dung in considerable quantity preserved intact, after four or five years, between the soil and dried stems and leaves of furze; and every one knows that in every other earth this dung thus buried in leaves would have been decomposed, and disappeared after only a few months.

These energetic agents, which have presided over the formation of furze earth and turf, are the brown acids analagous to tannin or tannic acid, a bitter principle, a powerful preservative of organised bodies. They exist, doubtless, in furze earth, associated with others whose action leads to the same results, especially with carbonic acid, as M. Ad. Brongniart and other authors have shown. Now, these brown acids are met with abundantly in nut galls, in oak bark, in the bark of certain resinous trees, of the elm, of the sumach, and of many other vegetables, ill adapted, or even unfit for the nutrition of animals, whilst we find no trace of them in the tissue of cereals and of other alimentary plants. It is, therefore, rational to admit that these acids are opposed to the vegetation of these same plants, and it is only by neutralising their action that the charcoal immediately renders new or furze earths fertile.

Fifthly, if certain bases of animal charcoal neutralise, as I have just said, the bitter or acid principles which the furze earth contains, it is necessarily by combining with these same principles. Now this combination must perform a great part in the marvellous effects which the charcoal produces, and if it had not taken place, these effects would be much less. If, then, the phosphates which the bone charcoal contains neutralise the acid which abounds in the furze earth, it is combination with that acid which renders them soluble in water, and easily assimilable, so that it is precisely those phosphates which have become soluble which furnish to cereals the considerable quantity of phosphoric acid which analysis demonstrates in grains, and particularly in wheat.

But if this acid were wanting in furze earth, if it had been absorbed by the marl or lime, mixed with the soil in considerable proportions, or if it had already been gradually neutralised, as occurs in parts of the lands which serve habitually for the passage of domestic animals, by the effect of the dejections of these animals, then the very powerful action of the phosphates, which results principally from their prompt decomposition, would be slower and less energetic, and would be found considerably modified and diminished. This naturally explains the inferiority of cereals obtained, by means of charcoal, on parts of the lands or furze lands which have served for the passage of cattle. It would also explain

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that incompatibility with marl and lime which MM. Chambardel and de Gourcy have noticed, but without pointing out the cause of it.

Therefore, to sum up, the residual animal charcoal of sugar refiners produces no perceptible effect on old lands, as observation has proved, because they are exhausted of vegetable humus, and because it cannot restore it to them, as stable dung would do, since it does not contain any itself.

With regard to new or furze earth, the animal charcoal completes the eminently fertilising principles, but of a vegetable nature only, which the furze earth contains, by furnishing to it, under a promptly assimilable form, the elements necessary for alimentary plants which are wanting in it, and especially the nitrogen, which the albumen of the blood disengages under the form of ammonia.

It outstrips and increases, in a considerable proportion, the regular, but slow and limited action of the air, rain, and other meteorological agents.

It instantaneously neutralises the bitter and acid principles of the furze earth, which principles are at once opposed to the cultivation of alimentary plants, and favorable to the vegetation of plants unfit for the nutrition of animals.

Finally, the phosphates which the charcoal contains, combining with the acids diffused in the furze earth (not containing marl), become, by the effect of this very combination, soluble in water, and then furnish abundantly to cereals the quantities of phosphoric acid which these plants, and especially wheat, imperatively require.—*Comptes Rendus*, No. 6, February 9, 1852.

RESEARCHES ON THE WATER EMPLOYED IN IRRIGATION.

BY MM. EUG. CHEVANDIER AND SALVÉTAT.

We have chosen, as the foundation of our work, seven springs very near each other, placed in a valley of the Vosges, in analogous conditions of exposure, of situation, of height above the level of the sea, of temperature and of apparent purity; the soil which they water presents likewise the greatest analogy, and the very slight differences which were found in it by analysis, were evidently due to the prolonged action of the very waters the influence of which we wished to discover.

We will, in this extract, restrict ourselves to presenting, in a summary manner, the results relative to two of these springs, so as to render the discussion more precise.

Is the fertility of irrigated fields in proportion to the quantities of water put in action, which would indicate that it is especially due to the action proper to water? Is it, on the contrary, to a certain point, independent of these quantities, and belonging to the presence of matters in solution which the water, acting as the vehicle, brings to the roots of the plants?

Such was the problem which we had to solve.

The first year we regulated the irrigations according to the local customs. The field watered by the bad spring received 255,744 cubic metres of water per hectare, and the field watered by the good spring 164,281 cubic metres; the weight of the crops was, from the first field, 2312 kilogrammes per hectare, and from the second, 7896 kilogrammes.

The second year, on the contrary, we placed ourselves in identical conditions relative to the quantities of water, which were 126,273 cubic metres per hectare from the bad spring, and 130,311 cubic metres from the good spring. The weight of the crops was 2,749 kilogrammes per hectare from the field watered from the bad spring, and 10,469 kilogrammes from the field which had the water of the good spring.

These crops were always cut with a scythe on the same day and by the same man, so as to be, as far as possible, in comparable conditions.

By admitting as perfectly dry matter, that which, reduced to as small pieces as possible, shows by the balance no further loss of weight after several dessiccations at 284° F. in a dry vacuum, we found that our hay contained, when cut, quantities of humidity varying from 21 to 27 per cent., our after-grass quantities varying from 24 to 34 per cent., and that, after having been nearly a year in preservation, these quantities of humidity were reduced to 12½ or 14 per cent. for the hay, and to 14 or 15 per cent. for the after-grass.

The elementary composition of the various hay and after-grass appeared to present but slight variations, the nitrogen excepted.

The quantities of mineral matters contained in these crops varied from 5 to 6 per cent. in the hay, and from 9 to 10 per cent. in the after-grass.

We thus see that with equal quantities of water, and in conditions, in other respects perfectly comparable, or even with larger quantities of water from the bad spring, the crop of the meadow watered by this spring has only been one-third or one-fourth of the crop produced under the influence of water from the good spring. It is then in the

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quality of the waters and not in their quantity that we should seek for the causes of these very considerable differences in the crops.

We have successively analysed the gases* and the mineral or organic matters dissolved or held in suspension in these waters. The quantity and the nature of the gases are nearly similar; the mineral matters also exhibit sufficient similarity for us to suppose that these springs arise from the same subterranean sheet of water, and that in traversing the soil to arrive at the surface of the earth, they become modified, either by ceding to the strata they traverse some of their elements, or by becoming charged with variable quantities of organic matters. These last are of a deep brown color, and we think that we have recognised the presence of humic acid, of humine and of the crenic acid of Berzelius. We have found no ammoniacal salts.

The gases dissolved in these waters are carbonic acid, oxygen, nitrogen and sulphuretted hydrogen. Whether we examine their total volume or consider them each separately, we find, neither in their nature nor their quantity, the cause of the differences presented in the crops.

The mineral matters are silica, chlorine and iodine; sulphuric, phosphoric, carbonic and arsenious acids; potassa, soda, lime, magnesia, alumina, the oxides of manganese and of iron. Their total proportion was determined by slow evaporation made on considerable quantities of liquid. These substances are some soluble in water, some only soluble in hydrochloric acid, finally, some insoluble in these two agents: under this last form we think we may consider them without action on vegetation. The same as in the case of the gases, whether we examine the total quantity of mineral matters, or seek to find the influence of such of these substances as we found in appreciable quantities and under the soluble form in water or the acids, we find, neither in their nature nor in their proportions, the cause of the differences which we have mentioned in the crops.

We can therefore only seek the solution of the problem in the organic substances dissolved in the waters of irrigation. According to the centesimal composition of these matters, in the two springs taken as types in this extract, oxygen and hydrogen are found in the same proportion. But these matters are more rich in carbon in the bad spring and more rich in nitrogen in the good. The nitrogen of the good spring is to that of the bad as 100 is to 42, whilst the carbon of the bad spring is to that of the good spring as 100 is to 94.

These two proportions do not suffice to explain the different fertilising powers which we have met with, if we merely considered the total quantity of organic matter spread by irrigation on 1 hectare, or even the quantity of nitrogen contained in this organic matter. In fact, in 1847, the bad spring furnished 1677 kilogrammes of organic matter per hectare, and the good spring only 953 kilogrammes. In the same way, in 1847, only taking into consideration the spring irrigations, we find that the quantities of nitrogen contained in the organic matter of the waters employed in the irrigation of 1 hectare, were, for the bad springs 40 kilogrammes, and for the good spring 33 kilogrammes only; and, notwithstanding, the hay gathered, after this irrigation, was in the proportion of one of the bad to three of the good. Thus, in this case, the greatest production coincides with the least absolute quantity, whether of organic matter or of nitrogen.

It is not therefore sufficient for one spring to be more fertilising than another, that it should yield a larger quantity of organic matter, or that the absolute quantity of nitrogen contained in the organic matters which it brings upon the soil should be greater.

But if, instead of considering merely the absolute quantities either of organic matters or of nitrogen contained in these matters, we seek the relative proportions of the nitrogen and carbon which enter into their composition, we find that 100 of carbon corresponds in the good spring to at least 11 of nitrogen, and, for the bad spring, to 4 of nitrogen at the most, whence we see that the fertilising properties of our good springs correspond completely to a proportion three times stronger of nitrogen considered relatively to the carbon.

1,000 kilogrammes of liquid manure contain, in their organic matter, 600 grammes of nitrogen. According to the table of manures of MM. Boussingault and Payen, the normal quantity of manure for 1 hectare is 66,000 kilogrammes of liquid manure per annum; 1 hectare therefore receives 40 kilogrammes of nitrogen.

This is exactly the result at which we arrived in 1848 with the good spring, by bringing the quantity of water used in irrigating one hectare up to nearly 130 millions of kilogrammes. In fact, 1,000 kilogrammes of water from the good spring, corresponding nearly to 1 cubic metre,

* The analyses of the gases have been made by M. Lewy.

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contain 0·33gr. of nitrogen: the 130 millions of kilogrammes of water used represent therefore 43 kilogrammes of nitrogen.

The effect of this irrigation was the greatest fertilisation that could be given to a meadow, and this ought not to surprise us, since the water which we used might be likened to very good liquid manure in a great state of dilution.

Do we mean to say that having served for the irrigation of one hectare, the whole of the water will be deprived either of the organic matter that it contained or of the fertilising nitrogenous matter? We do not think so, but it appears to us evident that a certain portion must have been absorbed: new experiments would be necessary to decide if the waters which owe special qualities to the presence of nitrogenous organic matters lose, in fact, a portion of their fertilising properties, if, according to the expression of the irrigators of the Vosges, *it unmanures itself* after having served to irrigate a certain extent of meadow.

However this may be, the useful action of nitrogenous organic substances in irrigations appears to us to be clearly demonstrated, as well as the neutralising action which is exercised with regard to them by certain substances which are probably deprived of nitrogen.

CONCLUSIONS.

1st. In two springs situated alike, the waters of which were employed for irrigation in equal quantities, and which produced different crops, the good effects of the fertilising spring appear to be due;

Neither to the gases held in solution in the water;

Nor to the soluble alkaline or earthy salts which they contain;

Nor to the silica;

Nor to the ferruginous compounds;

Nor even to the mass of organic matters dissolved in the water.

2nd. These fertilising properties seem to depend on the proportion of nitrogen contained in the organic matters dissolved in the water.

3rd. But it is not sufficient to consider the absolute quantity of nitrogen; we must likewise take account of the relation which the nitrogen bears to the carbon in the organic matters contained by the water of irrigation.

4th. Having abstracted the mineral matters, a fertilising source resembles very much a very dilute liquid manure.—*Comptes Rendus*, No. 8, February 23rd, 1852.

APPLICATION OF ORGANIC CHEMISTRY TO PERFUMERY.

FROM A LETTER WRITTEN BY DR. HOFMANN TO PROFESSOR LIEBIG.

THE beautiful investigations of M. Cahours upon the oil of *Gualtheria procumbens*, which have made us acquainted with the nature of this compound, so much used in perfumery, appear not to have been lost sight of in the arts.

The arrangement of the oil of wintergreen in the group of the compound ethers could not do otherwise than direct the attention of the manufacturers of perfumery to this extensive class of bodies, the number of which is daily increased by the active energy devoted to the field of organic chemistry. The remarkable fruity odor of many of these ethers had not been overlooked by chemists; but it was reserved for practical men to make the selection, and ascertain the proportions in which certain of these compounds resemble the aroma of particular fruits in so great a degree, that we almost feel ourselves led to the idea that these very compounds are the cause of the odor of the fruits in question, and that they would be found in them if the processes were followed on a sufficiently large scale.

The artificial production of aromatic oils for commercial purposes has only been carried on for the last few years; but although the process of fabrication is so new, yet it appears to be already in the hands of several distillers, some of whom make tolerably large quantities. The jury were enabled to satisfy themselves of this in their examination of the products belonging to this department in the Exhibition. We found in our surveys at the Exhibition, both in the English and in the foreign divisions, a copious selection of these chemical articles of perfumery, the applicability of which was moreover illustrated by the simultaneous exposition of the confectionary flavored with them.

Unfortunately, most of these oils were only sent in small quantities, so that the specimens which I was enabled to obtain in but few cases allowed of accurate examination.

The compound most frequently exhibited was a liquid labelled "*pear oil*," which, on examination, was shown to be an alcoholic solution of pure *acetate of amylic oxide*. As I had not enough of the compound to allow of its sufficient purification for ultimate analysis, I decomposed it with potash, when free fusel oil separated, and the acetic acid was determined in the form

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of the silver salt. The acetate of silver gave per cent.—

Theory.	Experiment.
64·68	64·55

The acetate of amylic oxide, when obtained by the ordinary process (1 part of sulphuric acid. 1 part of fusel oil, and 2 parts of acetate of potassa), evolved a remarkably fruity odor; but the agreeable odor of the Jargonelle pear was not distinct until it was diluted with 6 vols. of alcohol. On close inquiry of the exhibitors, I ascertained that tolerably large quantities of this oil (in one case 15-20 lbs. weekly) are manufactured. It is principally used for flavoring pear-drops, which are much admired in England, and which consist almost entirely of barley-sugar.

Next came the *apple oil*. As the examination shows, it is nothing more than valerianate of amylic oxide, and every one is at once reminded of the insupportable odor of rotten apples, which fills the laboratory, in making valerianic acid. When the crude distillate of this operation is treated with dilute alkali, the valerianic acid is separated, and an æther is obtained, the solution of which in about 5 or 6 vols. of alcohol possesses a most agreeable aroma of apples.

The essence in greatest quantity was the *pine-apple oil*, which, as you are aware, is only butyrate of oxide of ethyle. This compound also, like the above two, does not evolve the agreeable odor until diluted with a large amount of alcohol. Butyric ether, which in Germany is frequently added to the inferior kinds of rum, is principally used here for flavoring a kind of lemonade (pine-apple ale). For this purpose it is, however, seldom prepared from pure butyric acid, but generally by merely saponifying the butter, and distilling the soap with concentrated sulphuric acid and alcohol. The liquid thus obtained of course contains other æthers besides butyric ether, but it may be used in this state for flavoring. The specimen which I analysed appeared, however, to be the pure ether prepared from butyric acid. When decomposed by potassa and converted into a silver salt, it yielded—

Experiment.	Theory.
55·33	55·38 per cent. of silver.

The so-called *cognac oil* and *grape oil* were sent by English, as well as by French and German exhibitors. They appear to be used pretty commonly for imparting the favorite cognac odor to low brandies. Unfortunately the specimens exhibited were too small in quantity to allow of my instituting an accurate examination of these oils. The cognac oil especially was in very small quantity. On the addition of water to the whole of the sample, a few drops only separated, and these consisted of a mixture. The grape oil is also an amyle compound, dissolved in much alcohol; for when treated with concentrated sulphuric acid, the oil, freed from alcohol by washing with water, yielded sulphate of amylic oxide, which was identified by the analysis of the barytic salt. It yielded 45·82 per cent. of sulphate of baryta.

The crystallised amylo-sulphate of baryta with 2 equivs. of water, analysed by Cahours, and again recently by Kekulé, contains 45·95 per cent. of sulphate of baryta. It is certainly remarkable that we see here a body, which, on account of its insupportable odor, is separated from brandy with the greatest care, again applied in an altered form to flavor this beverage.

I must also allude to the *artificial oil of bitter almonds*. When Mitscherlich, in 1834, discovered nitrobenzole, he little thought, after twenty years, to find this body in an industrial exhibition. He certainly, at that time, pointed out the remarkable resemblance which the odor of nitrobenzole had to that of oil of bitter almonds; but the only sources for obtaining benzole at that time, viz., the oil of compressed gas and the distillation of benzoic acid, were much too expensive, and put an end to the idea of substituting the use of nitrobenzole for oil of bitter almonds. However, as you recollect, by means of the well-known aniline reaction, I showed with the utmost certainty the presence of benzole in the common light oils of coal tar, which had frequently been previously suspected; and in 1849, C. B. Mansfield showed, by a careful investigation, that benzole may be procured easily, and in large quantity, from oil of coal tar. In his memoir, which contains many valuable details upon the practical applications of benzole, the possibility that the fragrant nitrobenzole may be obtained in larger quantities is alluded to. As the Exhibition shows, this remark has not been lost sight of in the arts. Among the articles of French perfumery, with the title of *artificial oil of bitter almonds*, and the fanciful name of *essence of Mirbane*, there were several specimens of oils, which, on accurate examination, proved to consist of more or less pure nitrobenzole. I was not enabled to acertain accurately the extent of this fabrication; but it appears to me by no means inconsiderable. Here, in London especially, tolerable quantities of this artificial oil of bitter almonds are prepared. The very simple apparatus used is

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that proposed by Mr. Mansfield. It consists of a large glass worm, the upper end of which branches into two tubes, which are provided with funnels. A stream of concentrated nitric acid flows slowly through one of these funnels, whilst the other is for the benzole (which for this purpose need not be absolutely pure). At the point at which the tubes of the funnels are united, the two bodies come in contact; the chemical compound formed becomes sufficiently cooled in passing through the worm, and only requires to be washed with water, and finally with some weak solution of carbonate of soda, to be ready for use. Although the nitro-benzole closely resembles oil of bitter almonds in physical properties, it possesses, however, a somewhat different odor, readily recognised by a practised person. However, it answers well for scenting soap, and would be extensively applicable for confectionary and for culinary purposes. For the latter purpose it has the special advantage over oil of bitter almonds, that it contains no prussic acid.

Besides these, several other similar products were exhibited, but most of them were of too compound a nature, and in too small a quantity, to allow of their composition being accurately determined. In the case of many of these essences, their resemblance to the aromas specified was very doubtful.

The application of organic chemistry to perfumery is still in its infancy; and we may expect that a careful survey of those ethers and etherial compounds with which we are at present acquainted, and those which are daily being discovered, will lead to further results. The interesting caprylic ethers which M. Bouis has lately discovered are remarkable, from their extremely aromatic odor (thus the acetate of caprylic oxide possesses an odor as strong as it is agreeable), and promise, if they can be obtained in larger quantities, to yield new materials for perfumery.—*Ann. der Chem. und Pharm.*, vol. lxxxi. p. 87, and *Chemical Gazette*, March 1, 1852.

NOTE ON THE MEANS OF MULTIPLYING PHOTOGRAPHIC PROOFS ON METAL, BY TRANSFERING THEM TO ALBUMINISED GLASS.

BY M. AIMÉ ROCHAS.

PHOTOGRAPHIC proofs obtained on metal in the best possible conditions, so faithfully reproduce the image of nature that no other fault can be found with them than those of reflecting and the difficulty of multiplying them.

Photographic proofs obtained on paper do not present any reflection, and they may be multiplied *ad infinitum*; but they are deficient, to a certain extent, in the shading existing in so high a degree of perfection on metallic proofs.

It was therefore desired to unite the advantages which each of these methods separately presents, and to avoid their inconveniences. To solve this problem, it sufficed simply to fix the natural image directly on a metallic plate, and to transfer this image carried to perfection by means of the camera obscura, on to albuminised glass which may be afterwards used for multiplying it on paper, by the processes in common use.—*Comptes Rendus*, No. 7, 16 February, 1852.

RESULTS OF EXPERIMENTS RELATIVE TO THE EMPLOYMENT OF THE AMMONIACO-MAGNESIAN PHOSPHATE AS MANURE.

BY M. ISIDORE PIERRE.

I THINK, says the author in concluding his memoir, that I may thus sum up the results of the trials which I have made.

1. The ammoniaco-magnesian phosphate, employed in the proportions of 150 and 300 kilogrammes per hectare, exerted on wheat crops a very decided favorable action:

2. All things being similar, its action seems to be more evident on lands which are beginning to be worn out by too frequent a repetition of cereal crops;*

3. One of the constant effects of the ammoniaco-magnesian phosphate on wheat crops is, a sensible increase in the specific weight of the grain; this increase amounted to 3 per cent. in some of my experiments;

4. Employed on buck-wheat, in the proportion of 250 to 500 kilogrammes per hectare, in a land of very moderate quality, this same phosphate produced in it very remarkable differential results; the crop of grain was more than sextupled; the straw was more than tripled.

ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.

Improvement in Daguerreotype Apparatus. By W., W. H., & J. LEWIS. American Patent.

Claim.—We claim, first, the construction

* From the analyses of MM. Boussingault, Berthier, Payen, Peligot, Johnston, &c., it is known that it is precisely the crops of cereals which remove from the soil the large portion of phosphate.

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of a camera-box, with a cross opening or mortise, to receive a sliding frame, that carries both an object glass and the daguerreotype plate, as described.

Second. The construction and application of a sliding frame with a division to receive a frame carrying an oblong object glass, so formed as to be placed either vertically or horizontally, as described and shown.

Third. The construction of the slide so as to receive, in the other division, a daguerreotype plate in a frame, such frame being pressed in place by springs, and held in place by blocks taking notches in the frame, as described and shown.

Improvements for preserving animal substances from decay by means of a composition applicable to the cure of certain diseases. PIERRE ARMAND LECOMTE DE FONTAINEMOREAU, of South Street, Finsbury. (A communication.) Patent dated September 4, 1851.

These improvements consist in the employment of metallic salts, but principally of sulpahte of zinc in aqueous solution, for the preservation of corpses, and anatomical parts, and animal substances generally, and to the cure of wounds and external diseases.

For the prepartion of the sulphate of zinc, any salt of that metal may be employed; but the patentee prefers to employ metallic zinc in a granulated state. This he dissolves in such a proportion of dilute sulphuric acid as to produce a solution of a strength of about 30° to 40° Baumé. After allowing the solution to stand for a time sufficient to cause the deposition of the foreign matters held in suspension, he decants the clear, and employs it in the preservation of corpses by injecting through an artery. If the subject is to be exposed to the air, or kept in a naked state, the patentee recommends that a third part by weight of spirits of turpentine should be mixed with the solution; he employs also other essences when odors of any particular kind are required, and colors the fluid red.

When animal substances are to be preserved by immersion, the solution is made in the same way as above mentioned, only that it is employed at a strength of 20° to 25° Baumé. If the solution is to be employed for purifying rooms from the taint of decomposing organic matters, it is used of a strength of about 10° Baumé.

For the cure of wounds, the solution is prepared in a highly concentrated state, and reduced to 3° to 4° Baumé, by the mixture therewith of decoctions of linseed marsh-mallow, and other emollient herbs. In this state it is used by saturating lint and applying it to the wound. The solution may also be reduced to 2° or 3° Baumé, and used as a wash for the hands.

Claims.—1. The application of metallic salts, but principally of sulphate of zinc at the degrees of strength mentioned, or thereabouts, for the presrvation of corpses, anatomic parts, and animal substances in general from decay.

2. The appliction of the solution described, combined with emollient substances to the cure of wounds, and other similar external diseases of the human body.

Improvements in preserving animal and vegetable substances. BARON CHARLES WETTERSTEDT, of Grosvenor Street, Commercial Road. Patent dated September 4, 1851.

The first part of this invention consists in prserving animal and vegetable substances by drying the same when mixed with flour of corn or potatoes, and packing them in air-tight cases The patentee takes beef or mutton, and having removed the fat and bones, he cuts or chops the meat into small pieces, which he mixes with flour, and then exposes to a gradually increasing heat (say from 70° to 120° Fahrenheit), in a suitable chamber, spreading the same on wire cloth or reticulate trays, in order to admit of the air acting eqally on every part thereof. When dry, which will be readily ascertained by the vapor ceasing to arise, the meats or vegetables are remov and packed up in bottles, earthen jars, glazed inside and out with a glaze that does not contain lead. The corks or stoppers of the bottles, before being inserted, are dipped into melted beeswax and their outside is covered with pitch and powdered coke. When the materials are packed in wooden barrels, the whole of the exterior thereof is coated with pitch and powdered coke. The coke powder may be also advantageously used to fill completely the interior of bottles, jars, or barrels, partially filled with meat or vegetables dried and prepared as aforesaid, care being taken that the materials are covered from contact with the coke employed.

The second part of the invention has relation to the preservation from decay of canvas and other similar fabrics. for this purpose the patentee takes fresh burnt lime, which he slacks with water to reduce it to powder, and he adds thereto one part of powered resin for every ten parts of lime. These materials he diffuses in hot water and sprinkles thraugh a sieve over the surface of the canvas or fabric, using a brush to cause the same to penetrate well into the fibres of the cloth. Simultaneously with this opera-

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tion, he also sprinkles the canvas with a mixture of ten parts of linseed to one part of sperm oil. The canvas or fabric is ready for use as soon as dry. Sixteen pounds of the lime mixture and two gallons of oil will be found sufficient to prepare in this manner 1000 yards of canvas.

Improvements in the treatment of certain animal and vegetable substances to render them more convenient for use as articles of food, and for their better preservation. GAIL BORDEN, jun., of Galveston, Texas, Manufacturer. Patent dated September 5, 1851.

These improvements consist in manufacturing meat biscuits by combining the nutritive properties of animal flesh in a concentrated state with farina, flour, meal, or pulverised biscuit, and then drying or baking the same.

The patentee selects meat of any description in good condition, and boils the same by the aid of steam until the whole of the nutritive principles are extracted. He then strains the liquor, and after allowing it to stand, to give time for any suspended impurities to settle, he evaporates the same in the vacuum pan, or by other suitable means, to the consistence of thick treacle, shaking off the fatty portions which rise to the surface, and adds, while still in a hot state, a sufficient quantity of flour meal or pulverised biscuit, to produce a stiff dough, which he kneads well, and rolls, or presses, and cuts into the form of biscuits. These biscuits are then dried or baked in an oven, and afterwards packed in air-tight cases or bags to preserve them for use. Or they may be ground or reduced to powder, and packed in that state in air-tight cases for preservation.

For the purpose of making soup, the powdered meat biscuit is mixed with hot water, and, after standing, is boiled with the addition of salt and other condiments to render it palateable.

By treating meat and flour in this way, an article is obtained extremely portable, capable of being preserved for a considerable period of time, and not liable to be attacked by weevil.

Claim.—The mode of treating animal and farinaceous substances by combining the nutritive properties of flesh, in the state of concentrated extract, with farina, flour, meal or pulverised biscuit, and then baking or drying the same, to render them more convenient for use, and for the purpose of their better preservation.

A certain process for uniting cast iron to cast iron and other metals, and for uniting other metals together. AIME NICOLAS DERODE, of Rue St. Roche, Paris, Gentleman. Patent dated August 14, 1851.

Mr. Derode's process of uniting metals to each other consists in the employment, in conjunction with ordinary heat, of a succession of electric or electro-galvanic shocks. The metals may be operated on either in the solid or partially liquid state. The metals are first scoured with acidulated water, the effects of which may be aided by heat and electric agency, then rubbed with wire brushes, placed in contact with each other in the position they are ultimately intended to occupy, have solder applied at the meeting parts, are heated by means of a clear fire in a suitable furnace, and, while the solder is melting, a rapid succession of electric shocks is caused to act on the two metals so as to combine with the solder, to produce perfect union of the two. The solder which the patentee prefers is composed of two parts yellow copper solder, one part brass, and one six-hundredth part nickel in powder; but other may be used, and these proportions may be varied. The joint produced by the process described is stated to be so perfect as to be capable of resisting a force more than sufficient, in the case of two bars of iron united together by it, to fracture the bars.

Claims.—1. The uniting of metals by the agency of electricity (either magnetic or electro-galvanic), with the usual scouring processs, and with the addition of ordinary heat.

2. The combining electric agency (either magnetic or electro-galvanic), with the scouring procees.

3. The application of an electric multiplier to the scouring process and to the the soldering of metals.

Improvements in the manufacture or treatment of paper, or fabrics, to prevent copies or impressions being taken of any writing or printing thereon. HENRY GLYNN, of Bruton Street, Berkeley Square, gentleman, and RUDOLPH APPEL, of Gerrard Street, Soho, anastatic printer. Patent dated August 14, 1851.

This invention consists in preventing the transferring of designs from printed, engraved, or written documents, by impregnating the paper or other fabric with a solution of salt of copper (by preference nitrate or sulphate of copper), and then applying an alkaline solution, which is preferred to be

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that of phosphate of soda, so as to produce a cupreous precipitate, insoluble in water, on the face of the paper or fabric, which precipitate shall be capable of being acted on chemically by the surface or material employed to produce a transferred impression.

The salt of copper may be applied in solution to manufactured paper, or it may be introduced into the pulp in the process of manufacture: — One ounce of nitrate of copper, or its equivalent of sulphate of copper, is sufficient for two gallons of pulp. The paper having been impregnated with the salt of copper solution, and treated with an alkali, to produce an insoluble precipitate of the copper in the form of hydrated oxide, or other salt, is subsequently immersed in a saponaceous solution, composed by adding to a solution of an alkali, as much fixed oil (not a drying oil), as it will readily convert to soap, and then mixing therewith an equal quantity of old palm oil. Or it may be composed of equal parts of white soft soap and old palm oil. Half-a-pound of this mixture, dissolved in one gallon of hot water, forms a solution suitable for use, as above mentioned. The saponaceous solution may, if thought desirable, be employed without previously impregnating the paper with a solution of salt of copper.

The patentees do not confine themselves to the use of salts of copper, as those of lead and zinc may be employed, as well as other metallic salts which are known to possess the property of being acted on chemically by the surface or material employed to produce a transferred impression from a written, printed, or engraved document.

Improvements in unhairing and tanning skins. GEORGE LAYCOCK, late of Albany, New York, dyer, but now of Doncaster, tanner. Patent dated December 1, 1851.

1. *Unhairing Skins or Hides.* — The skins are first soaked in water and unfleshed, and broken up in the ordinary manner. The patentee then takes 6 lbs. of soda ash, pearl-ash, potash, or any other strong alkali, and 6 lbs. of unslaked lime, and boils them in six gallons of water. He then adds to this mixture sufficient water to reduce the strength of the solution to 14° Twaddle's Alkali Hydrometer, and immerses the skins, handling them well at first, so as to expose to the solution every part of their surface. The skins are allowed to remain in the mixture until the hair starts at every part, when it is removed with knives, and the skins are then worked out in clear water, as is ordinarily practised by tanners.

2. *Sheep Skins.*—To remove the wool from sheep skins, the patentee applies with a white-washing brush to the flesh-side some of the above solution. In about two hours, the solution will have caused the wool to start, when it is removed with knives, and the skins are then well worked out, as customary. This process effects a considerable saving of time over the system of limes at present adopted in the trade.

3. *The Bait.*—Instead of using hens' and pigeons' dung, the patentee makes the bait by mixing with water a sufficient quantity of sulphuric acid to give it a perceptibly acid taste. The skins are immersed in this liquor, and will generally run down in an hour or two, but if they should not run down fast enough, more acid must be added, and the skins are then to be well worked out in clean water. The acid is subsequently neutralised with stale urine, and the skins are again well washed.

4. *Tanning the Skins.*—For this purpose the patentee takes for, 100 calf skins, 100 lbs. sumach, 50 lbs. terra japonica, 12½ lbs. sulphate of potash, and 12½ lbs. alum, which he boils for half an hour in sufficient water to cover the skins. He then macerates in cold water 40 lbs. oak bark, which he adds to the above mixture, and immerses the skins therein, handling them well at first, and continuing to do so until the skins are found to be tanned, which will generally be in about six or eight days. The quantity of liquor above mentioned is sufficient for twenty cows, oxen, or horses' hides, and for a hundred sheep's, calves' or other skins.

5. *The Grain.*—The grain must be laid with weak liquor of the kind last described.

Claims.—The improvements described in unhairing and tanning hides and skins.

Improved methods of obtaining fresh water from salt water, and of concentrating sulphuric acid. ALPHONSE RENE LE MIRE DE NORMANDY, of Judd-street, gentleman, and RICHARD FELL, of the City-road, engineer. Patent dated August 7, 1851.

The apparatus for freshening salt water consists of a vertical cylinder, having a series of horizontal partitions communicating each with the one below it, and each with a pipe leading to a condenser. A space is left between the sides of the cylinder and the partitions, to allow of steam circulating freely within the interior of the cylinder. The salt water to be freshened is introduced into the apparatus from the top, and circulates over the partitions, and the aqueous vapor arising from it passes off to the condenser, and on its way becomes mixed

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with atmospheric air introduced through a suitable pipe, and issues from the condenser in an aërated state, while the water arising from the condensation of the steam admitted into the cylinder is discharged therefrom without being aërated. The apparatus may be constructed of any suitable materials, but the patentees recommend the use of zinced or galvanized iron.

For "concentrating sulphuric acid," the apparatus consists of a horizontal cylinder or envelope, surrounded by a furnace, and having a set of longitudinal partitions, by which it is divided into compartments, each of which communicates with the one above and below it. Each of these partitions is turned up at one end, so as to direct the acid flowing on to it from the partition above towards the opposite end, whence it flows over to the partition below it, and traversing each successively (the apparatus being meanwhile maintained in a heated state), is concentrated thereby, by evaporation and distillation, and delivered from the apparatus at the lower part. The water vaporised by the heat of the furnace passes off through a suitable aperture in the upper part of the cylinder, or envelope. The cylinder itself is lined, and the partitions are covered with leaf platinum, or the partitions may be composed of glass, porcelain, or some other material not affected by sulphuric acid.

Claims—1. The above-described method of procuring fresh water from salt water, of whatever materials the apparatus may be composed, or however the different parts thereof may be placed with reference to one another, so long as the same effect is produced substantially in the same manner.

2. An apparatus in which sulphuric acid is made to flow upon slabs unattackable by that acid, placed within an envelope, which may be, like platinum, unattackable by sulphuric acid, and whereby the acid in question is concentrated by evaporation and distillation, as above described.

Improvements in delineating objects, and in apparatus and materials for that purpose. JAMES PALMER, of Paddington, artist. Patent dated August 23, 1851.

The purpose of this invention is to furnish the means of producing drawings of all descriptions of objects in a much simpler and more perfect manner than is effected by the camera lucida, camera obscura, graphic telescope, and other instruments hitherto proposed for that purpose.

A plate of glass is mounted in a frame or easel, which is furnished with suitable adjustments for supporting the glass in a vertical position at any convenient height. On one side of the plate of glass, and at a distance of several inches from it, is fixed the frame of a pair of spectacles, which is also capable of adjustment in position. One of the apertures of the spectacle frame is closed by a plate or shutter. The operator applies his face to the spectacle frame, and looks with one eye through the glass at the object which he wishes to delineate, and he then traces over the outline of the object on the glass, with a pencil formed of a mixture of wax, soap, shellac, and lamp-black, which is capable of marking very distinctly on the smooth surface of the glass. In this way, an exact drawing of the object, in true perspective, is obtained with great facility. The spectacle frame preserves the position of the eye without interfering with freedom of vision. The instrument is very convenient, and its use is readily acquired, which can scarcely be affirmed of any of the instruments hitherto proposed for the purpose, as is shown by the very slight use which is made of such instruments.

The drawing on the glass is transferred to paper by tracing it, or by pressing a moistened sheet of paper upon it.

The same apparatus is used in a similar manner for drawing with an etching needle on a sheet of gelatine supported by the glass, or on a sheet of glass coated with gelatine. The drawings thus made may be printed from the gelatine as from a copper plate. To enable the gelatine to be used for printing on moistened paper without adhering to it, it is rendered insoluble by immersing it in a solution of alum, borax, and acetate of lead. Gelatine so prepared does not adhere to the paper, and may be immersed in cold or warm water without injury. The prints from the gelatine may be transferred to stone or zinc, and printed in the ordinary manner of lithographic printing. The invention is applicable to making drawings and engravings of buildings, machinery, landscapes, flowers, or any other stationary objects. For taking portraits, a rest is provided to keep the head of the person in a stationary position.

These drawings or delineations are necessarily smaller than the real objects, and their size may be varied by varying the relative distances of the glass, and the object from the eye of the spectator. When it is required to increase the size of the drawings, a drawing on glass or gelatine is placed in an instrument somewhat similar to a magic-lantern, by which a magnified imagem is thrown on a disc of glass ground on both sides. A sheet of gelatine is fixed on the

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back of the glass disc, and the magnified image traced upon it with the etching needle, or with the pencils above mentioned.

Claims.—1. The modes of constructing apparatus for delineating.

2. The mode of delineating objects in the apparatus, and with the pencils described.

3. The mode of delineating objects upon gelatine with the etching needle, and printing the delineations so made.

4. The mode of enlarging the delineations made as aforesaid.

5. The apparatus for enlarging the delineations.

6. The mode or modes of manufacturing insoluble gelatine.

Improvements in drying malt. BENJAMIN HALLEWELL, of Leeds, wine-merchant. Patent dated September 4, 1851.

These improvements consist in the employment for drying malt of numerous jets of gas, alone or in combination with the use of steam.

The gas or steam pipes are placed alternately under the floor of the malt-house, which is constructed of perforated tiles, for the ready transmission of the heat, and the burners of the gas pipes are placed on each side of the same, so as to play on the outside of the steam pipes, as well as against the under side of the perforated tiles. The advantage of using gas is, that it admits of the heat applied being regulated with great nicety, and at the same time it prevents the condensation of the steam in passing through the steam pipes.

Claim.—The employment of numerous jets of gas, alone or combined with the use of steam, for drying malt.

Improvements in the manufacture of wrought iron tubes. TIMOTHY KENRICK, of Edgbaston, Warwick, iron-founder. Patent dated September 4, 1851.

These improvements consist in enamelling and glazing the interior surfaces of wrought iron tubes.

For this purpose the patentee employs two compositions—one to form the body, and the other the glazed surface. The body glaze is composed of 100 lbs. calcined flints, reduced to a fine powder; 75 lbs. borax, also in powder: these ingredients are fused into a mass and, when cold, ground in water, dried, and mixed with potter's clay in the proportion of 40 lbs. of the composition to 5 lbs. clay, and sufficient water to produce a paste of a creamy consistence. The glaze is to be poured into the tube, and the tube turned round so as to expose every part of its surface to be covered by the pasty mass. The second glaze is then applied, in a state of powder, over the whole interior surface and the tube is then heated in a muffle until the glazes are melted. Should the whole of the interior, however, not have been properly covered with the surface glaze it will be necessary to apply a further quantity of it and to reheat the tube sufficiently to vitrify the additional quantity so applied. The surface glaze is composed of 100 lbs. Cornish stone, 117 lbs. borax, 35 lbs. soda ash, 35 lbs. saltpetre, 35 lbs. sifted slack lime, 13 lbs. white sand, and 50 lbs. white glass in powder. These several ingredients are calcined together, ground in water, and dried. To 45 lbs. of the mixture, in powder, is then added 1 lb. of soda ash, and they are mixed together in hot water, and, when dried, produce a powder which is used as above directed.

The patentee observes, in conclusion, that the surface of cast iron tubes have heretofore been enamelled and glazed, and that, therefore, he claims the enamelling and glazing in the manner described, the interior surfaces of wrought iron tubes only.

Improvements in extracting the colouring properties of madder, and in rendering useful the water employed in such processes. DOMINIQUE JULIAN, of Sorgues, France. Patent dated September 4, 1851.

These improvements are applicable to madders of all descriptions. The patentee takes 2 cwts. of ground madder, which he places in a vat, and adds thereto 115 to 118 gallons of water, according to the degree of fineness of the madder. He then runs the liquid madder into a filter composed of woollen cloth, strained over a frame, and supported inside a large vat, which should be provided with a tap for the purpose of drawing off the water which passes through the filter. The filter itself should be capable of containing six cwts., so that it may be filled by repeating the above operation three times. After all the water has passed through, the pasty mass of madder is placed in bags and subjected to pressure in a hydraulic or other suitable press, for the purpose of expressing all the remaining water, which is to be added to that already contained in the vat. The madder is then to be dried by exposing it in a suitable chamber to heat of from 120° to 160° Fahrenheit, and when dry it is to be thoroughly mixed, so that every part of it may be of equal quality. In this state it is called flowers of madder, and a given quantity of

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it will be found to produce a better effect in dyeing than an equal weight of madder not so prepared. It also gives the turkey red to calico dyers, and facilitates the dyeing of wool.

The waters which have been obtained as above emntioned, are placed in vats capable of holding from 2500 to 3000 gallons, and subjected to a temperature of about 70° to 85° Fahrenheit, to induce alcoholic fermentation. If this should not take place in five or six days, a small quantity of hot water, having barm dissolved therein, is to be added. The strength of the liquor will be at first from 3° to 8° Baumé, but as soon as fermentation has commenced it will not be more than 1° or 2°. The fermented liquor is subsequently submitted to distillation, for the purpose of obtaining spirit therefrom

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Improved methods of producing or obtaining printing dyes and other substances used in printing, which improvements, in whole or in part, are applicable to other like useful purposes. JAMES ROBERTSON, of Oxford Street, Manchester, chemist. Patent dated August 21, 1851.

Claims.—1. A method or system of extraction described, in so far as respects the manner of combination therein in one connected and continuous series of the processes of feeding, treating, lifting, and discharging, whereby the materials from which the extract is to be obtained, are supplied at the bottom of the apparatus, and the liquid solvent at the top, and the former are, by successive liftings, raised to the top in a more or less exhausted state, while the latter, with the extractive matter, gravitates successively to the bottom, and is there collected in a state fit for use, without that long exposure to the deteriorating effects of heat which attends the ordinary methods of extraction, and without the necessity for using pumps or exhausting apparatus for separating the extracts from the materials under treatment.

2. A mode of obtaining dry extracts of meat, in so far as respects the combination of the mode of evaporating the same to drynes, with the subsequent mixture of the same in certain cases with gelatinous or farinaceous matter, as articles of food.

3. Certain mechanical arrangements, whereby the extract or substance to be evaporated is supplied to, and then made to pass over, by its own gravity, as often as necessary, a large amount of heated surface in thin films, and whereby it is speedily reduced to the required consistency.

4. The combination of a revolving cylinder or cylinders with scrapers, whereby the extract, by adhesion to the external surface of such cylinder or cylinders so heated, is brought up and round to the scrapers for collection in a concentrated mass.

Improved apparatus for facilitating the more perfect combustion of fuel, whereby funnels in steam vessels, and chimneys or shafts for factories, may be dispensed with. JOHN TRESAHAR JEFFREE, of Blackwall, engineer. Patent dated August 21, 1851.

The object of the present invention is to produce a more perfect combustion of the gases, and other products arising from steam-boiler furnaces than has been hitherto obtained, and this is effected by causing the products of combustion to be drawn from the flues by a rotating fan, or other contrivance, and to be mixed with such a proportion of atmospheric air as shall insure their combustion; after which the gases so mixed are returned to be consumed in the furnace.

Claims. — 1. The apparatus described wherein the products of combustion are intermixed with atmospheric air, and are then returned by the action of a fan-blast, or otherwise, to the furnace, and are for the most part consumed.

2. The regenerating bridge described, between which and the ordinary furnace bridge the products of combustion are caused to pass.

Improvements in producing ornamental surfaces on metal and other materials. THOMAS SKINNER, of Sheffield. Patent dated August 14, 1851.

The "improvements in ornamenting metals" consist in combining for this purpose the processes of transferring designs from suitable plates and electro-plating, or electro-gilding,

A design or pattern having been drawn on a copper plate, an impression from it is transferred to the metal to be ornamented, and the surface left uncovered is then stopped out with a varnish composed of gum guaiacum dissolved in spirits of wine. As soon as the varnish is dry, the ink impression is removed by rubbing it with a sponge dipped in turpentine, after which dilute acid is applied to eat away the portions of the plate formerly covered with the design. The plate is then submitted to the process of electro-plating or electro-gilding, and the ornamentation thereby completed. Or, in the case of Britannia metal and German silver, a pattern may be transferred,

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and then sunk by acid, as above described, without resorting to the process of electro-plating. If it should be desired to produce a pattern in relief, the mode of operating above mentioned is reversed, and the parts of the metal on which the design is printed are protected from the action of the acid employed to reduce the unprinted portions of the plate, by sprinkling resin in a powdered state over the impression, and then melting it by the application of gentle heat. The raised portions of the plate are subsequently electro-plated or electro-gilded by the processes ordinarily adopted for that purpose.

The "other materials" alluded to are bone and ivory, which the patentee ornaments by transferring designs on to their surfaces; and when the portions of the plate required to be left plain have been covered with gum or varnish, the bone or ivory is submitted to the action of dilute acid, to open the pores of the material, and the permanent pattern is then produced by a suitable dye or composition; or the dye may be applied without the previous use of dilute acid.

Claims.—1. The means described of producing ornamental surfaces on metal.

2. The means described of producing ornamental surfaces on bone and ivory.—Collected from the *Mechanic's Mag.*

IMPROVEMENT IN DAGUERROTYPING.

A GENTLEMAN in Charleston, U.S., is said to have made a valuable discovery in the art of daguerrotyping. The advantage claimed by the new process is, that it requires no glass to protect it, inasmuch as it is covered with a transparent enamelled surface, which renders the picture impervious to the effects of the atmosphere, and less liable to be rubbed off. In fact, the more friction that is used on the surface, the brighter and clearer the picture becomes, and so durable is it, that it can be sent in a letter any distance, without the possibility of its being scratched or defaced.

PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

CHEMICAL, PHARMACEUTICAL AND THERAPEUTICAL RESEARCHES ON THE OIL AND SEEDS OF CROTON TIGLIUM.

BY M. DUBLANC.

(*Concluded from page* 281.)

THE seeds of croton tiglium give about 35 per cent. of oil by pressure; they give 52 to 53 per cent. with ether. This operation should be performed by means of displacement. In these circumstances the ether recovered by distillation is not acid, and the oil possesses all these qualities. When a known quantity of croton oil is put in contact with ten times its weight of alcohol at 95°, the alcohol dissolves 6 per cent. of its own weight, and the oil loses 50 per cent. of its weight.

The insoluble portion of the oil loses its color, its odor, a considerable portion of its acridness, and the whole of its acidity.

The portion of oil dissolved being separated from the alcohol by evaporation is more viscid, more colored, more acrid and also more acid.

The oil undissolved by the alcohol may still give some portion to a new quantity of alcohol, and lose all the properties which form its character. The action of the alcohol on the oil, observed on respective volumes, presents differences which enable us to trace it through its whole course. Twenty volumes of oil being agitated with one hundred volumes of alcohol at 95° until the column ceased to diminish, a reduction of five volumes of oil dissolved in the alcohol was proved, in the proportion of one of the first to twenty of the second. In a subsequent operation, when the oil was renewed, the column of oil only lowered three volumes instead of five. At the fourth operation the oil did not lose a single volume. This would be also the proportion which it would yield to new quantities of alcohol and renewed washings, because this amount of solubility belongs to the oil such as it has been constituted by the action of the alcohol which removed from it the principles which it could part with and which were foreign to it. Brought to this state of homogeneousness, this oil is slightly amber-colored; it is without odor, flavor and acidity; it may be held in the mouth without producing any sensation. It dissolves in all proportions in ether. Its specific gravity as compared with that of water is 92.

It is thus evidently proved that an entirely inert and soft oil exists, as a constituent part of the oil furnished by the seeds of the croton.

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All the active principles accompany that portion of the oil which dissolves in alcohol; it likewise shows itself more powerfully charged with all the properties before distributed between the united portions.

But are these active principles themselves inseparable from the portion of the oil which serves as their vehicle? After being drawn together by the mechanical action of the solutions, are they susceptible of being yet more completely isolated, and of losing a still greater quantity of the oil which unites them? This process of elimination might be found by causing the most powerful solvent of the active elements to act on a relatively much more considerable quantity of oil. In these conditions the alcohol employed as a solvent would show a preference and a kind of election of some principles to the exclusion of others.

To try this, we had recourse to the following experiment:

Two kilogrammes of oil of croton tiglium were taken; a demi-kilogramme of alcohol at 95° was put into it and left in for several days: a very clear separation took place. The superior portion, formed of alcohol and oil, was far from representing the quantity used. This phenomenon had its explanation in the proportion of alcohol which the oil itself can dissolve, and which is about 10 per cent. After separating the supernatant portion of the liquid, it was necessary to remove the alcohol. Heat was for this purpose, a no less simple than natural application, but it might have the very serious inconvenience of acting at the same time on the principles the very concentration of which would favor their volatilisation. The employment of water removed this fear and should attain the end by mixing with the alcohol without being able to mix with the oil. However cautious, still a difficulty presented itself in the execution of this operation. The mixture formed an emulsion, and the separation of the bodies from each other would have required too large a quantity of water. By pouring ether into the liquid until no more could be dissolved, the oil rose to the surface and was freed from ether by exposure to the air. Whilst this operation and the necessary manipulations lasted, the emanations manifested their powerful energy. The eyes, nostrils and lips were painfully affected, and the face was covered with an erisypelatous redness.

The oil furnished by this process was of a black brown, and opaque; it was thick; its odor was very powerful and its acidity very decided. When laid on the skin, it produced pain in a very short time; and, after the vesication which it produced, it caused a scar.

It was soluble, in all proportions, in alcohol of 95 degrees, and in ether of 56 degrees.

Its mixture with nine-tenths of olive oil formed a liquid whose action is very superior to that of the oil extracted from croton seeds.

From these facts it is possible to conceive the mobility of the active elements of croton oil, and they lead to the hope that we might be able more completely to isolate them. However, all the attempts which I have hitherto made have proved fruitless. By following up the study of chemical reactions on this body, I may perhaps be able to raise a corner of the veil. I intend to make one of these researches the second part of this paper. The information furnished by this study, fixes the properties of croton oil with sufficient clearness to enable us to find in them an application to the operations of pharmacy.

THERAPEUTICAL AND PHARMACEUTICAL APPLICATIONS.

At present there exists only one preparation for which the pharmaceutist uses croton seeds. This preparation is the extraction of the oil.

The guide which every practitioner of good conscience and good sense should follow is the Codex, to which all submission is due until realised and generally proved progress obtains in its turn the right of becoming the rule of all; the Codex gives a *modus operandi* for obtaining croton oil.

We have already had occasion to describe this process in giving the means which we employed for procuring the oil necessary for our first experiments. This process is at first simple pressure and then pressure with the aid of alcohol.

There is a regular mode whose production may be regarded as constant, and affording confidence that the medicament made in these conditions possesses certain properties. But the difficulties which result from the want of a powerful press and economical appliances occasion a fear that the process of the Codex is not always followed with fidelity. Some weight is given to this fear by the remarks frequently made that croton oil varies in its effects, being sometimes active and sometimes inactive. The nature of the seeds may have some part in this variability; but the variation of the processes may also partly occasion it.

With the view of correcting the causes of uncertainty which the authorised process produces, pharmaceutists who have the

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laudable desire to ensure in their medicaments stability of effect, have proposed modifications. Not long since, (1849) M. Dominé (see THE CHEMIST, New Series, Vol. I. 1849-50, page 38), a distinguished chemist at Laon, with the view of putting his brethren in a situation to extract the oil without pressure, and to avoid the danger of fraud, proposed having recourse to the method of displacement. The liquid which he considered suitable for obtaining the oil was composed of one part of sulphuric ether of 56° and three parts of alcohol of 95 ; he stated that the advantages of this process were proved by the quantity and quality of the product.

In all cases, operators and authors are always much preoccupied with the presence of crotonic acid in the oil, and with the part which it has to fulfil as a collective agent of the properties of the medicament.

Now that we are enlightened concerning the phenomena attributed to crotonic acid, we may be warranted in risking some critical observations on the processes in use.

In the first place, in examining the process of the Codex, we perceive that it is divided into two parts. In the first, the oil is obtained by simple pressure; in the second, it is accompanied by alcohol. If the first oil is exactly such as the seed contains, this is not entirely the case with the second. Since the most active materials, being very soluble in alcohol, may abandon the oil and fix themselves in the alcohol, these matters must be found in greater quantity in the oil of the second pressing than in that of the first. The inconvenience will be so much the greater as more oil remains in the cake, from the want of a powerful press. There might be a still greater difference in the oil if the process of the Codex were departed from. We are acquainted with a pharmaceutist who, in the most honorable spirit of delicacy and exactitude, uses in his establishment only the oil furnished by the seeds by simple pressure.

When, in another point of view, but with the like honorable motives, an ethero-alcoholic liquid is used, the active principle whose relative solubility always prevails over the soil, accompanies that which is displaced, abandoning that which resists the action of the liquid.

Whether we conform to the process of the Codex, or prefer displacement with alcohol or ether, the products do not accurately represent the oil which the seed furnishes directly by expression, which alone is homogeneous, and which may be regarded as a type.

Since ether is the perfect solvent of the oil, contained in the seed, and since it acts on it without effecting any elimination of parts, it must be the only body which can be employed for the oil obtained to be similar to that which is furnished by pressure, that is to say, that with all the oil we have all the principles of its action. By introducing 100 grammes of croton seeds, freed from their envelopes and well divided in a displacement apparatus, and passing ether through it until a few drops received on paper leave no greasy stain, the liquid being exposed to the air or distilled at a very low temperature, leaves as a residue a very homogeneous and very active oil, which represents from 50 to 55 per cent. of the seeds freed from their envelopes.

We propose this process to the experimentation of physicians, in order that it may take its place in the Codex when a new edition is published. It is needless to add, that until then no substitution can be authorised, and that it can only be employed by special request.

The experiments which we have performed on ourselves in the long course of this investigation, have led us to make an application of croton seeds which may be useful, but which has not hitherto been made. A decorticated seed of croton tiglium weighs, on the average, 1 decigramme. If it be divided very carefully, either alone, or, better still, with an equal part of a fatty body,—lard or oil,—this seed, spread on cloth, and applied to the skin, developes a more powerful action than the natural oil.

The proportions of decorticated seeds and fatty bodies, always equal, being increased according to the extent of surface to be submitted to its action, the phenomenon will be produced with certainty in proportion to the sensibility of the skin.

SUMMARY.

From the experiments and facts contained in this paper it results :—

1. That croton oil does not contain a volatile acid ;

2. That the acid of this oil is fixed or retained by the oil, which does not separate from it at the heat of 212° F., nor by distillation ;

3. That the acrid volatile principle which exists in croton oil is not of acid nature, and that at present it has not been extracted ;

4. That the active principles of croton oil are capable of abandoning one part of the oil to be concentrated in the other ;

5. That croton oil is not of homogeneous composition, but formed of an inert portion

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of which alcohol dissolves only a tenth part, and of another, much more soluble, carrying with it the active principles;

6. That the greatest degree of concentration may be realised by the action of a small quantity of alcohol in a large quantity of oil;

7. That ether employed by the displacement method may be preferred to the means in use for obtaining the oil;

8. That pulp of the croton seed applied to the skin, alone or associated with a fatty body, may favorably supplant the action of the oil.—*Gazette des Hôpitaux.*

EFFECTS OF SWALLOWING VIRULENT MATTERS IN THE DIGESTIVE ORGANS OF MAN AND ANIMALS.

BY M. RENAULT, DIRECTOR OF THE VETERINARY SCHOOL OF ALFORT.

THE author sums up his work in the following conclusions:—

1. That the dog and the pig may eat, without danger to their health, all the products of secretion, whatever they may be, all remains, cooked or uncooked, of animals affected with contagious diseases referred to in these investigations, namely, glanders, the pestilential diseases called blood of the spleen, madness, contagious typhus, and the peripneumonia of cattle, and the contagious epizootia of gallinacious animals.

2. That it is the same with what follows with regard to the same diseases, with the exception of that which is proper to themselves, and on which it could be necessary to experiment out of the epizooticatmosphere, which I have not been able to do, before coming to a conclusion on this point.

3. That the virulent matters of glanders and acute farcy, which completely lose their contagious properties in the digestive organs of the dog, the pig, and the fowl, retain them, although much diminished in energy, in those of the horse.

4. That the virulent matter of the blood of the spleen, which the dog, the pig, and the fowl may eat without inconvenience, often give rise to carbuncular symptoms when it is swallowed by the herbivora, such as the sheep, the goat, and the horse.

5. That this immunity, as regards contagion, which the carnivora and omnivora fed with virulent matters enjoy, whilst the latter may produce all their effects when they are swallowed by the herbivora, might be owing to the virus being evidently, from their origin, principles of animal nature, would undergo, in organs destined for digesting animal food, modifications which, by altering them profoundly, would make them lose their deleterious properties, which, from their organisation, are capable of digesting only vegetable aliments.

6. That whatever their explanation may be, it is proved, indeed, that pigs and fowls do not undergo, either in their health or in the quality of the products which they furnish for the consumption of man, any alteration in consequence of having been fed with matters from animals which have died of glanders or farcy, carbuncle, or madness, and that man may eat without danger the flesh and products of these animals thus nourished.

7. That the baking and roasting of meats, and the boiling of liquids arising from animals affected with contagious diseases, have the effect of annihilating the virulent properties of these meats and liquors to such an extent, that not only may the glandered matters be swallowed with impunity by the horse, the sheep, and the goat, and the remains of fowls which have died of epizootia by fowls, but also that all these matters which are so active, whose contagious power is so energetic, and so certain when they are inoculated in the fresh state, remain completely inert on every animal, even after their inoculation, when they have been cooked.

The practical consequence of the facts explained in this memoir is therefore:—

A. That there exists no sanitary reason why pigs and fowls should not be fed with the remains of the *clos d'ecarissage*, whatever they may be.

B. That, however comprehensible may be the repugnance of man to consume meat or milk from cattle, pigs, sheep, or fowls, affected with contagious diseases, there is in reality no danger in his eating cooked flesh or boiled milk, furnished by these animals. *Journal de Chimie Médicale*, March 1852.

ON PHYSALINE, THE BITTER PRINCIPLE OF THE PHYSALIS ALKEKENGI.

BY MM. DESSAIGNES AND CHAUTARD.

THE *physalis alkekengi* has been much praised as a remedy in intermittent fevers. Does there exist in this plant a febrifuge principle which might be used as a substitute for guinine? For the purpose of discovering this, we have subjected alkekengi to some chemical experiments, and we have now the honor of communicating the results of our labors to the *Société de Pharmacie.*

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Every part of the alkekengi is bitter, above all the leaves and the capsules which enclose the fruit. In our first experiment, we exhausted the dry leaves with alcohol, by means of a displacement apparatus, distilled the alcoholic solution, and dried the residue in the sand bath. It was bitter, but much colored with chlorophylle.

In a second experiment we exhausted the leaves, by displacement, with cold water. The liquor was brown and bitter; animal charcoal deprived it of its bitterness; the charcoal, when washed and dried, was treated with boiling rectified alcohol, and left, on evaporation, a scanty, yellowish brown, and very bitter residue.

Finally, in a third experiment, potassa was added to the aqueous solution, then quickly agitated with chloroform (about 20 grammes to a quart of solution); an almost white deposit settled after long repose, which was separated from the supernatant liquid, and completely washed by decantation, by means of a funnel, the beak of which was closed by a cork. By evaporation this deposit left a pulverulent residue, almost colorless and bitter.

This substance is not nitrogenous, neither does it behave like an organic alkaloid with the acids. We consequently omitted the potassa in an extraction on rather a large scale, which we undertook by means of chloroform.

To remove all the bitterness from the aqueous solution of alkekengi, it required two treatments with chloroform, renewed each time, and the mixture must be shaken for at least ten minutes. The bitter principle, obtained in this way, was purified by dissolving it in hot alcohol, adding a little charcoal, precipitating the filtered liquor, and washing the precipitate on a filter with cold water.

This bitter substance, which may be called *physaline*, presented the following properties: It is a light, white powder, with a yellowish tinge, which we have been unable by any means to remove. Its taste, weak at first, is afterwards of a fresh bitter, remaining long in the mouth. When very dry, it becomes electrical by friction; under the microscope, there is no appearance of crystallisation. When heated, it softens towards 356° F., and at 374° F. it is in a state of pasty fusion; but then it becomes colored and full of bubbles. It burns with a fuliginous flame, and leaves no residue; it is sparingly soluble in cold water, which, however, removes the bitterness; it is more readily soluble in boiling water; it is very sparingly soluble in ether. It dissolves very readily in chloroform, and still more quickly in alcohol, especially with the aid of heat.

Physaline is very sparingly soluble in the weak acids, and its solution in hydrochloric acid, evaporated to siccity, retains only traces of acidity. Heated with potassa, it does not disengage ammonia; it dissolves very readily in heated ammonia; but evaporation separates it entirely from this alkali. It is not precipitated from its alcoholic solution by ammoniacal nitrate of silver, but it is by acetate of lead and ammonia, under the form of a flocculent and yellowish precipitate.

I. 0·279 gr. of matter dried in vacuo gave by analysis CO^2, 0·6525 gr., and Aq. 0.159 gr.

II. 0·423 gr. gave CO^2, 0·986 gr., and Aq. 0·240 gr.

I.	II.	Calculation.
C..63·78	C..63·57	C^{28}....63·64
H.. 6·33	H.. 6·30	H^{34}.... 6·06
		O^{10}....30·40

The precipitate of physaline by ammoniacal acetate of lead was washed quickly and dried in vacuo. 0·403 gr. calcined gave a mixture of lead and oxide of lead, representing 0·219 gr. of oxide of lead, or 54·34 per cent. Calculation gives, for the formula, $C^{28}H^{30}O^9$, 3PbO, 56·70; but we are far from considering the equivalent and formula of physaline as sufficiently established by this one experiment. Our desire to retain a sufficient quantity of this substance for clinical experiments, prevented us from pushing our researches further. The bitter principle of the holy thistle, the cnicine, resembles physaline in its composition. In fact, it contains C. 62·9, H. 6·9 and O. 30·2.

We must further mention, in terminating this little work, that we have extracted from the ripe berries, the taste of which is agreeably acid, although mixed with bitterness, an acid crystallising in fine crystals all of whose reactions rendered it easy to recognise it as citric acid.—*Journal de Pharmacie.*

TREATMENT OF ACUTE ANGINA BY CRYSTALLISED ACETATE OF LEAD.

BY M. RUL-OGEZ, PHYSICIAN AT ANTWERP.

℞ Distilled water ..... 150 gr.
Gum arabic ..... 16 gr.
Crystallised acetate of lead 30 to 50 centi.
Simple syrup ..... 32 gr.

F. S. A. This mixture is perfectly clear,

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and without precipitate; it is not so if plain water is substituted for distilled water.

The patient uses this as a gargle every hour; it is not disagreeable, and has no inconvenience, excepting that of sometimes slightly blackening the tongue. In the intervals, M. Rul-Ogez recommends the decoction of carrot, and sometimes a purgative. He never exceeds the dose of 10 centigrammes in 32 grammes of liquid; and although, when an attack is taken from the beginning, it is usually diminished in twenty-four to thirty-six hours; but when it has acquired a violent intensity, two or three days' use of the remedy are sometimes required before the cure is completed. The saturnine preparation does not act as an astringent in these circumstances, but as an antiphlogistic, resolutive, and hyposthenisant.

Since the employment of this medicament, M. Rul-Ogez has not observed any suppuration of the tonsils; and many of his patients, who formerly had periodic attacks of most painful angina of the tonsils, with the formation of abscesses, have for some years succeeded in preventing any relapse by using this gargle on the slightest indication of angina.

When children are too young to be able to gargle their throats, a piece of linen rolled up is to be steeped in the saturnine solution, and the throat moistened with it every hour.

The proportion of the lead salt is too small for any inconvenience to result in case a small quantity of the gargle should pass into the primae vial.

If the angina continues after some days, and an abscess forms, M. Rul-Ogez suspends the saturnine gargle, and employs the following maturative gargle—

	gr.
Rain water	192
Gum arabic	8
Cream of tartar, rendered soluble by decoction with borax	16
Common mustard	16
Mulberry syrup	32

This gargle generally brings the suppuration to maturity in from twenty-four to thirty-six hours, and we are rarely obliged to have recourse to puncture of the amygdalœ and emetics to excite the evacuation of the pus, which takes place generally spontaneously.

But when the evacuation has taken place, M. Rul-Ogez has again recourse to the saturnine gargle, which soon finishes the cure, without its being prolonged for several days, or passing from one amygdala to the other.

The saturnine gargle does not suit chronic angina of the soft palate, nor in folliculous pharyngeal angina, but in chancre of the throat it resumes its efficacy, especially when combined with antisyphilitic treatment.—*Annales de la Société de Médecine d'Anvers.*

CONCENTRATED SEA WATER.

It is well known that M. Moride, of Nantes, has sent to the Academy some concentrated sea water and a memoir on its preparation. M. Jolly has read the following report on this communication:

"The object of the work sent by M. Moride is to compose sea baths by means of the sea water itself, by concentrating it, and collecting its mineral and organic principles in such a manner as to be able to keep and transport them to any distance that may be wished, with as much certainty of their composition as confidence in their therapeutical properties. The extract of sea water thus obtained by means of concentration and evaporation, would serve for the composition of an artificial sea water bath by merely mixing it with simple water in certain proportions or to a suitable degree of saturation, such as 5 kilogrammes of concentrated sea water to 100 litres of river water.

"One of the members of the commission has analysed the products sent to the Academy by M. Moride, which consist of 1st, a saline residue of a pasty consistence and greyish color; 2nd, an amber liquid produced from the salt pits. He devoted himself to the search of the principal elements, the really active elements, to which sea water owes its therapeutical properties. It results from this examination that the product of the sea water taken at Croisic and concentrated by the processes of the author to the degree wished for, a long journey, and its mixture in simple water, represent in as exact and identical a manner as possible, the sea water from whence it was derived. Thus, apart from the presence of a little sulphate of lime, which may be merely a product of reaction, and some gases which may have escaped in the operation, this first product contains all the other constituent principles of the sea water at Croisic, namely; chlorides of sodium, magnesium and potassium; alkaline and magnesian sulphates as well as iodine and bromine, in the state of salt, if not in great abundance, at least in very appreciable proportion. The commissioners think, consequently, that there is reason to welcome the idea of the author both in a scientific and practical point of view, and they propose to address to him a note of

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thanks and encouragement, and to deposit his work in the archives of the Academy.

"These conclusions, after some short observations, from M. Cloquet, were put to the vote and adopted."

One of the editors of this Journal, to whom M. Moride sent some concentrated sea water, which he used in baths, has found it excellent; he likewise gave some to M. Petroz, but we do not know what facts were observed by that chemist.—*Journal de Chimie Médicale*, February, 1852.

TINCTURE OF WHITE HELLEBORE IN PITYRIASIS VERSICOLOR.

BY DR. SPENGLES.

The name of hepatic stains has contributed to connect this complaint of the skin with an affection of the liver and the organs of the abdomen, and to cause its cure to be attempted by internal remedies which necessarily proved useless. At the present time dermatologists, such as Eichstedt and Hebra have proved that this affection is due to the formation of a kind of fungus; its cure is sought to be attained by means of external applications which are intended to destroy the parasite. Following the example of Rau, who mentions a case of the cure of hepatic stains of some standing by chlorine water, and of Zillienfet, who speaks in high terms of white hellebore, the author has tried this latter substance in the following cases:

Obs. I. A tuberculous girl, aged twenty-one years, affected for many years with hepatic stains occupying the whole of the upper part of the back, and extending to the neck and under the arms to the bosom, was cured in eight days with the tincture of white hellebore, without the administration of any other remedy, either internal or external.

Obs. II. A student of theology, who had for some years pityriasis versicolor on the region of the stomach extending towards the nipple, was treated without effect by acids and alkalis. He was completely cured in eight days by the external application of tincture of white hellebore.

Obs. III. A merchant's clerk, who had for a long time had pityriasis versicolor covering nearly the whole chest, a portion of the neck and abdomen, for the cure of which purgative and purifying remedies had been tried in vain, saw his exanthema disappear in a few days by frictions with the same remedy.—*Medicin. Zeitung.*

Tincture of hellebore may be prepared by the following process:—

	grammes.
White hellebore	60
Alcohol at 22°	240

Divide the hellebore, put it in contact with the alcohol; leave it to macerate for eight days; strain with pressure; then filter and keep it for use.

ON A NEW REMEDY FOR TENIA.

BY M. A. D'ABBADIE.

It is well known that tenia exists almost universally among the Christians of Abyssinia. In that country, those condemned to death always have three days' grace, not for the purpose of endeavoring to have the sentence annulled, but to expel their worm; for it is pretended that the worm abandons the corpse, and the sight of it is considered as most unclean. According to the natives, it appears among children as soon as they begin to eat raw meat, to which, moreover, the origin of this complaint is attributed. In fact, tenia is very rare among those tribes of Abyssinia whose religion or prejudices forbid the use of uncooked meats.

Among the eight or ten remedies most used in this complaint, none are known in France but the Kosso, improperly called *cousso*. This is a drastic purgative which fatigues the stomach, and often occasions such great nausea, that the patient cannot digest it; besides, it must be repeated every two months, and finally, it never produces a complete cure. Moreover, I have seen the use of Kosso produce always very obstinate, and sometimes fatal dysentery.

The musanna is free from all these inconveniences. It is the bark of a tree which grows near the Red Sea, in the neighborhood of Muçawwa. The dose is from 60 to 70 grammes, carefully pulverised, and administered in a semi-fluid vehicle, for example, in honey or gruel. The remedy is taken two or three hours before a meal, and the tenia is expelled the next day, generally without purging or griping. Sometimes the cure does not take place until the second or third day.

Although in Abyssinia the efficacy of musanna is universally admitted, I have not hitherto chosen to mention it to the men of science in Europe where the habitual diet and state of health differ so much from those of countries within the tropics. I thought it necessary first to try the new medicament on Europeans; and for this purpose I gave several doses of musanna to Dr. Pruner Bey, who practised in Cairo, and who proved nineteen cases due to this remedy. Since my return to France, I have sent a dose of

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musanna to a distinguished member of our diplomatic body, who had in vain tried all known remedies against tenia, not omitting Kosso. His fruitless trials had made him very distrustful, and he took the precaution to wait for some months after having taken the musanna before writing to me, that he believed himself to be radically cured of his long and annoying malady.

Notwithstanding this strong evidence, I do not wish to assert the certain efficacy of this remedy, before a new and severe examination, of which I have the initiative to the wise solicitude of the Academy. For this purpose, I send three doses of musanna; I will add to this quantity as it is required.—*Comptes Rendus*, No. 5, February 2, 1852.

VALERIANATE OF ZINC ASSOCIATED WITH THE EXTRACTS OF HYOSCIAMUS AND OPIUM IN NEURALGIA.

BY DR. TOURNIÉ.

THE good results obtained in facial neuralgia by the internal as well as external use of hyosciamus, preparations of opium, valerian and valerianate of zinc are well known. But it is likewise known that these affections, and especially those which are complicated with a rheumatic state, sometimes rebel against these different medicaments as well as against many others; for this reason we think it right to mention a formula from which M. Tournié says that he has drawn marked advantage.

This formula is thus composed:

℞ Valerianate of zinc ..... 30 centigr.
Extract of hyosciamus.... 16 „
Extract of opium ..... 8 „
Conserve of roses q. s.
to make six pills.

The first day two or three pills should be given, which each contain, as is seen, 5 centigrammes of valerianate of zinc, 25 milligrammes of extract of hyosciamus, and 13 milligrammes of extract of opium; one is to be taken every two or three hours and it is very rarely, according to M. Tournié, that this first dose does not calm the pain almost entirely. In this case one pill less is given on the morrow and following days; one or two if the first dose has been two or three, and at the end of four or five days, the neuralgia being quite cured, the medicament is discontinued; if on the contrary neuralgia does not perceptibly diminish under the influence of this first dose, it is necessary to continue the administration of the same number of pills.

According to M. Tournié this formula is only certain of success when employed in neuralgia of the fifth pair and of a continued type without syphilitic complications. When the neuralgia is of an intermittent or remittent type we can only depend at most, he says, on an abatement of the pain, and valerianate of copper would undoubtedly be very preferable. In support of this opinion M. Tournié reports the observation of eight cases: in one of them the patient occupied a damp ground floor in a newly built house; the neuralgia, which at first attacked the left eye, then fixed in the right with so much obstinancy that it resisted all the means employed in such cases. The cure was completed in three days by means of M. Tournié's pills.

In two other cases the patients had before been attacked by rheumatism, and one of them was under the influence of a rheumatic gout diathesis; there the treatment was a little longer; in the first case it lasted nine days, and about twenty in the second, in which several interuptions were rendered necessary by the appearance of other morbid symptoms.

Finally in the five cases of simple neuralgia of the sub-orbital and temporal regions, the cure took place in three cases, in two days, in one in three days, and in the other in six.

These are certainly results which should lead us to repeat M. Tournié's trials, and to prescribe this formula, which is, moreover, composed of medicaments which have already been employed singly with success in neuralgia.—*Union Médicale.*

EXPERIMENTS FOR DETERMINING WHICH SHOULD BE PREFERRED, FOR MEDICAL USE, RIPE OR GREEN POPPY HEADS.

BY DR. BUCHNER, SEN.

IT is known that the old pharmacopœias always recommend the employment of the ripe heads of *papaver somniferum* for the preparation of syrup of poppies.

The efficacy of this preparation has been determined by numerous observations. Murray asserts, in his *Apparatus Medicaminum*, that extract of poppy heads produces, in equal dose, twice as intense effects as opium.

M. M. Tilley, Winckler, and Merck, have discovered the cause of this efficacy of ripe poppy heads. The last two observers have found that 32 ounces of these capsules contain from 18-30 grains.

In the alcoholic extract of poppy heads with blue seeds, Winckler found morphia,

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narcotine, much narceïne, but not meconic acid.

The use of green poppy heads for the preparation of syrup of poppies is recommended only by the modern pharmacopœias, without this prescription being justified by reasons derived from experiments and the observation of facts.

When the capsules are gathered 8 or 10 days after the fall of the petals, and they are dried, they have, after desiccation, a mucilaginous and rather sweet than bitter taste, whilst the heads of completely ripe poppies immediately develope by mastication an extremely bitter taste. This previous observation led M. Buchner to think that ripe poppy heads contain a larger proportion of alkaloïd than the green heads, which, moreover, lose a portion of their juice in being cut.

Without giving here in detail the experiments made by M. Buchner, we will simply observe that he thought he might be able to determine the richness in alkaloïds of an extract of poppies by precipitating the alkaloïds by iodine. For that purpose, he adds to the aqueous infusion, made at a gentle heat, and neutralised with a little ammonia, ioduretted iodide of potassium.

The weight of the ioduretted combination which is precipitated is more considerable for the infusion of ripe poppy heads than for the infusion of green poppy heads, and that in the proportion of 158-100. He concludes that ripe poppy heads should be preferred for the preparation of syrup of poppies, although it is indisputable that the green heads contain meconate of morphia, and that they furnish a greater quantity of extract.—*Annalen der Chemie und Pharmacie*, New Series, t. iii.

ON THE ANALYSIS OF OPIUM, ESPECIALLY WITH REFERENCE TO THE PROPORTION OF MORPHIA CONTAINED THEREIN.

BY DR. RIEGEL, OF CARLSRUHE.

THE author in the first place enumerates the various methods of analysis which have been followed by several authorities, and then states, as the result of his own investigation and examination of these processes that he prefers Guillermond's method, with some modification, which he thus describes:—

Half an ounce of the opium to be examined is cut into small pieces and bruised in a mortar with spirit of alcohol at 71°; the fluid is then expressed through linen, and the refuse washed with from ten to twelve drachms of the same alcohol; the alcoholic solution is then to be filtered into a glass containing one drachm of spirits of ammonia. In twelve hours' time, all the morphia, with some narcotin and meconate of ammonia, will have become deposited. The separation of the gritty crystals of morphia, which adhere to the sides of the vessel from the light, pointed crystals of narcotin. In order effectually to separate the narcotin, the adhering meconate of ammonia must be removed by washing in water, and then shaking the crystals in pure ether, or better still in chlorform, by which the narcotin is readily dissolved, while the morphia remains entirely insoluble. After this treatment, the morphia is left behind in rather large gritty crystals, slightly discolored.

This process may be varied by employing boiling alcohol and powdered opium, and adding the solution, still hot, to the solution of ammonia. According to Guillermond, 15 grammes of opium should yield at least 1·25 grammes or 8.33 per cent. Reich estimates 10, and others 12 per cent. The author gives the per centage of morphia which is obtained by the various processes of different experimenters, and states that the largest proportion (13·50 per cent.) is procured by the modfication of Guillermond's method, now described, which he also considers the simplest and most certain for ascertaining the proportion of morphia.

The following process is recommended by Dr. Riegel for the detection of small quantities of opium. To the suspected substance some potash is to be added, and then shaken with ether. A strip of white blotting paper is to be moistened with the solution several times repeated. When dry, the paper is then to be moistened with muriatic acid, and exposed to the steam of hot water; if opium be present, the paper will be more or less colored red.—*Jahrbuch für praktische Pharmacie*, Oct. and Nov., 1851.

INJECTION OF CRYSTALLISED ACETATE OF LEAD IN CHRONIC CYSTITIS.

BY M. RUL-OGEZ.

Distilled water..... 192 gram.
Gum arabic..... 16 gram.
Crystallised acetate of lead 50 centigr.

Make several injections, and each time allow 32 to 64 grammes of the liquid to remain in the bladder during five or six minutes. These injections are repeated every two days for one or two months, according to the severity of the complaint.

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MEMOIR ON THE ABSORPTION AND GENERAL EFFECTS OF IODINE EMPLOYED IN DRESSINGS AND IN SURGICAL OPERATIONS.

BY M. BONNET.

IODINE applied to ulcers or injected into the cavities of abcesses and serous membranes, is absorbed, and is found in various products of excretion, especially in the urine and the saliva.

The absorption on the surface of closed cavities and the elimination by the excretions, especially the urine, may amount, during several weeks, and without alteration of the health, to more than 1 gramme per day. This absorption and this elimination modify the entire economy, and are capable of considerably modifying constitutional scrofulous diseases, provided that we maintain, by means of special precautions in the dressings, for at least six weeks or two months, such an elimination of iodine by the urine that reagents shall cause in it, without previous evaporation, a deep blue tint.

Vesicatories, cauteries and moxas absorb, with the greatest facility, the iodine which is deposited on their surface; and, after daily dressing, it may be found in the urine and saliva, so long as the artificial wounds are not cicatrised. By the aid of iodic treatment of vesications at some distance from the eyes, scrofulous opthalmia may be cured without internal remedies or local applications. Profound constitutional modifications are possible, if, for several months, such a quantity of iodine is absorbed by moxas or cauteries, that the urine may always take a blue tint with starch and chlorine.

Among iodic preparations, the only ones whose absorption is constant on the surface of ulcers or blistered surfaces are the vapor of iodine according to the process of M. Goin, and the iodureted iodide mixed with lard. Frictions with a pommade containing lard 30 grammes, iodine, 1 gramme, iodide of potassium 2 grammes, are preferable to all others, and especially to those with tincture of iodine.

For investigating the presence of iodine in the urine and the saliva, we may content ourselves with the solution of starch and that of hypochlorite of soda (Labarraquè's solution); and as animal liquids, especially urine, decolor the iodides of starch the intensity and the more or less prolonged continuance of the blue color produced by the reagents enable us to judge approximatively of the proportion of iodine.

By causing the absorption by the endemic method, not only of iodic preparations, but of various resolutives, such as hydrochlorate of ammonia, nitrate of potassa, hemlock, &c., more rapid and more certain resolution may be effected by them by applying these substances to the skin covered with epidemis.—*Comptes Rendus*, No. 8, 25th February 1852.

EXAMINATION OF THE SEED AND CAPSULES OF DIGITALIS PURPUREA.

BY DR. A. BUCHNER, SEN.

The author has examined the seed and capsules of *Digitalis purpurea*. The seed lost by drying at about 162° Fahr., 9.26 per cent. of water. The capsules are very slightly hygroscopic, and lose scarcely four per cent. by drying. The author prepared extracts of the seed and of the capsules with ether and water, and examined them. The following are the results arrived at :—

The seeds of *Digitalis purpurea* are preferable to the leaves, as they contain a larger amount of digitaline, together with a fat oil, are not so liable to be mistaken or collected at a wrong period, and are more easily dried and preserved without experiencing any alteration; in short, more dependence can be placed upon them.

The digitaline in the oily compound, which is easily prepared with ether from the seed, merits every attention in a therapeutical respect, for the seed, or the oily digitaline compound from it can be easily dispensed, and at a very moderate expense, in various forms, emulsion, powder, pills, &c.

The seed capsules and calyx of *Digitalis* likewise contain digitaline, but in proportionately far smaller quantity; so that the tannate of digitaline, which can be prepared from the aqueous extracts, is respectively as 3·00 and 0·33 per cent. of the weight of the seed and capsules.

This quantity, separated from the seed by exhaustion with boiling water, does not form the entire amount of digitaline; for like resinous substanes, it is not only soluble in aicohol but also in oils, and it is partially combined with the fat oil of the seed.

The oil containing the digitaline, which can be extracted by ether, amounts to about forty per cent. of the weight of the seed; it belongs to the siccative oils. Ether extracts, besides the oil, another more resinous digitaline compound, which sinks in water, while the oil floats on the top. A portion of the digitaline compound can be removed from the oil by water.

The tannate of digitaline is soluble in hot

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water; on cooling, it again separates for the greater part.

Digitaline prevents the fermentation of an aqueous solution of sugar; it must, therefore, be considered as a poison to beer yeast.—Buchner's *Repert.*, ix., p. 38.

ESTIMATION OF BROMINE.

Newcastle-on-Tyne, Feb. 25, 1852.

To the Editors of "The Chemist."

Dear Sirs,

In "THE CHEMIST" for this month, a memoir on the estimation of bromine is given, in which M. Figuier uses a normal solution of chlorine; in experiments he states however, that hydrochloric acid, added to the bromide solution, does not affect his test. Might I therefore suggest that, instead of a normal solution of chlorine, a solution of bleaching powder be used together with muriatic acid. Bleaching powder in the dry state, say 35 per cent. chlorine, may be kept for any length of time without loss in a bottle covered with paper. A solution of this may be made at any time in the same way as in testing bleaching powder with copperas. I need not say that this method would possess numerous advantages above that of the changeable solution of chlorine.

I remain, dear sirs, yours truly,

JAMES NIXON.

ON THE BARK OF THE MUSSANNA TREE, A CERTAIN REMEDY FOR TÆNIA.

BY DR. PRUNER-BEY.

ABYSSINIA is the country in which tænia is most common, and which indisputably possesses the surest remedies and truest specifics for the destruction of this parasite. The author says that he had successfully employed kousso until 1848, in hundreds of cases, when his friend, M. D'Abbadie, returning from a voyage to Cairo, with his interpreter, a native of Gondar, sent him a bag filled with the yellow bark of the mussenna, a popular remedy in Abyssinia for tænia. The first experiment with it was made on the interpreter. Bolusses made with 60 grammes of bark reduced to powder, and meat chopped up, and slightly baked, were administered to the patient, who took no nourishment but a little rice. On the evening preceding the administration of the medicine, and during the whole day, he ate nothing until evening, when he again had a little rice. Next day the entire tænia was passed, with a soft stool, in several pieces, rather soft and infiltrate.

During the last two years, the author has employed this remedy with complete success in nineteen cases. The action of the yellow bark of mussenna, of the family of leguminæ, is distinguished from that of kousso, in that it kills the parasite without causing diarhœa, and does not require, as is sometimes the case with kousso, otherwise an excellent remedy, other secondary means.—*Journal de Chimie Médicale*, February, 1852.

A VERY SIMPLE REMEDY IN ASTHMA.

BY DR. ALEXIS FAVROT.

TAKE a strongly saturated solution of nitrate of potassa. Dip tinder into it, and then allow it to dry.

Procure a wide-mouthed phial, the cork of which has an aperture in the centre, so as to admit any hollow tube whatever (a pipe, closed at the end, would suffice).

Light the piece of tinder, and place it in the phial. Then cause the patient to inhale the gases which are disengaged, either through the mouth or nostrils. At the end of a few inspirations he will find a relief which will augment.

Such is the very simple process which I have for a long time used with great success, when consulted by persons attacked with asthma.

It would perhaps be difficult to give an explanation of this mode of treatment which would be satisfactory to all minds.

I shall therefore content myself with giving, under a doubtful form, the following opinion:

Would there not be a small portion of oxygen inhaled by the patient, having been disengaged by the combustion of the nitrate of potassa?

Now, it is known that in asthmatic patients the sanguineous circulation is incomplete in the lungs, that the blood is imperfectly regenerated, that it is black, and does not burn its excess of carbon.

Would there then be combustion of this excess of carbon by the oxygen absorbed?—*Rèpertoire de Pharmacié*, January, 1852.

ON A PECULIAR PROPERTY OF ETHER AND OF SOME ESSENTIAL OILS.

BY M. SCHOENBEIN.

THIS property, which has just been made

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known by Professor Schoenbein, so well known by his discovery of ozone, is similar to that possessed by phosphorus, when put in contact, in certain circumstances, with pure oxygen or atmospheric air, of developing that powerfully oxidising agent which has received the name of ozone. If, says M. Schoenbein, a little ether is poured into a bottle of pure oxygen or of atmospheric air, and exposed to the diffused light, agitating it from time to time, the ether, after an interval of four months, will have acquired new properties. Although it does not act on litmus paper, it decolors the solution of indigo, converts pure phosphorus into phosphorous acid, eliminates the iodine from iodide of potassium, changes sulphate of protoxide of iron into bibasic sulphates and acids, transforms yellow cyanide of potassium into red cyanide, and converts sulphuret of lead into sulphate, etc. The essential oil of turpentine, and that of citron produce the same effects, if treated in the same way. According to M. Schoenbein, this new property is due to the presence of oxygen in an exalted chemical condition.—*Journal de Pharmacie et de Chimie*, Jan., 1852.

ON THE MORBID CONDITIONS OF THE KIDNEY GIVING RISE TO ALBUMINURIA.

BY DR HANFIELD JONES.

THE author commences by referring to the fact noticed, and dwelt upon by Mr. Bowman and others, that in consequence of the peculiar arrangement of the vascular system of the kidney, a more than ordinary pressure is exerted upon the capillaries of the Malpighian tufts, which, at the same time, being unsupported by fibre or solid tissue, are therefore peculiarly liable to rupture and hæmorrhagic effusion. These peculiarities will, of course, tell with increased effect if the organ becomes actively congested. These well-marked conditions of the kidney are noticed as existing in albuminuria. The first is the condition of engorgement, such as is seen in those who die in the early stages of acute anasarca, or in that of dropsy succeeding scarlatina. The organ is enlarged, dripping with blood in every part, its tissue not destroyed, but many of the tubes are seen under the microscope to contain coagula of exuded fibrine entangling blood-globules, and more or less of epithelium. Under timely and appropriate treatment, the author believes that complete recovery from this affection may take place, and the kidney be restored to its original healthy state. He formed this opinion partly on the result of one examination, partly on the testimony of general experience with respect to the recoveries which take place in scarlatinal dropsy.

The second form of diseased renal structure described is that of the large, heavy, often mottled, and pale kidney. In this there is no hyperæmia, or rather, the reverse state usually exists. The cut surface has not the appearance of healthy structure, and gives one the idea of some matter having been implanted among the natural constituents, so as to obscure them, and to produce a confined aspect. The tubes are found impacted with epithelial matter, but not by any means constantly obstructed or blocked up, although they are irregularly dilated. In some parts, though this is not the case in all instances, oily matter is deposited, and makes the tubes, where it exists, quite opaque. The evidence is, however, as clear as possible, that the morbid process is not of the nature of fatty degeneration The Malpighian tufts are often obscured by effused matter, and the medullary tubes more or less filled up with oily or granulous matter, washed down into them. The author believes that this state of disease may arise, either as a primary degeneration, without any preceding engorgement and hyperæmia, or that it may be the sequel of the first described condition.

The third variety of morbid change is that so familiar to observation as the dwindled granular kidney. The organ is generally somewhat congested, the cortical secreting tissue remarably atrophied, the capsule adherent to the surface, which presents the well-known granulations. In advanced cases there is found extreme destruction of the tubes of the cortical substance, their basement membrane is gone, their epithelium scattered about as mere *debris*, and their place occupied in many cases by an abundant cyst formation; the medullary tubes are filled up very often with more or less of granulous and oily matter. The Malpighian tufts are sometimes compressed sometimes obscured by films of exuded matter, somtimes they seem tolerably healthy. There is no very decided evidence of the formation of new fibrous tissue, as in schirrhus of the liver, but the nutrix often seems to have lost somewhat of its natural homeogeneous aspect, and to be infiltrated with a granulous stuff.

He coincides entirely with Mr. Simon's account of the origin of the cysts which are so numerously developed in many cases of granular kidney; he thinks the two following arguments conclusive as to the question

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whether they are formed solely from an alteration in the tubes, or as a secondary development out of their *débris*. 1st. That, as Mr Simon observed, they have a diameter sometimes less even than that of the tubes themselves. 2nd. That they are not formed in nearly all the instances of kidneys which have apparently undergone precisely similar destructive change of their tubular structure. He believes, however, that cysts are formed by dilitation of the tubes, and, perhaps, of the Malpighian capsules. The author adopts Dr. Prout's view, that the nature of the morbid change in the two latter forms of renal disease, is not such as can with any propriety be considered as inflamation, sub-acute or chronic; he coincides entirely in the original idea of this celebrated physician, that the disease is truly a degeneration, a spoiling and impairment of the whole organ, occurring quite independently of inflamation; but on which, inflamation or congestion may very easily, and does very commonly, at various times, supervene. This opinion seems to be strongly supported by the acknowledged causes of the disease, which are all of a debilitating nature, exhausting the organic life and vigor of the system. He further contends that the mere exudation of coagulable material into the tubes is insufficient to account for the atrophic change since it might continue to be washed out by the urine, which does not depend on their being retained in the organ, but on their being no longer formed in consequence of the hyperæmia having subsided.

In the treatment of acute anasarca, from whatever cause, cupping on the loin, bleeding if the strength allow, and tartar-emetic are pointed out as the means on which reliance may be placed. The action of the skin is to be promoted, and saline and other diuretics forborne, until the latter stage of the disease, when the author believes they may be employed with benefit. He compares their use at such times to that of squills, or the balsams in the latter stages of a bronchitis.

In the chronic form of disease, constituting "Morbus Brightii," the author remarks, that the degenerative nature of the affection should never be lost sight of, and that our chief endeavor should be, as long as any hope remains, to uphold, strengthen, and improve the constitution, by every tonic and corroborant means in our power. It is suggested also, whether, in consequence of the ascertained condition of the renal organs, their tubes containing unnatural, dense, occumulated epithelial matter, and when the Malpighian tufts being also overlaid by effused fibrine, it might not be of advantage to administer the alkalis, and especially the liquor potassæ, somewhat in the same way as was done by Mr. Brandish, in the hope of inducing a healthier condition of the epithelial lining of the tubes. This seems the more reasonable, from the known influence of the alkalies upon albuminous matters, and the experience we have of their deobstruent powers. — *Medical Society of London*, March 13, 1852.

RENEWED SECRETION OF MILK SEVERAL MONTHS AFTER WEANING.

M. GUBLER mentions several cases in *L'Union Médicale*, where the secretion of milk, being solicited several months after weaning, became completely re-established. The first case relates to a woman who had weaned her child for two months, when she was admitted into the children's hospital with her infant, who, since weaning, had fallen away considerably. M. Trousseau desired the child to be put to the breast; after a few days, milk was re-secreted, and the infant recovered perfectly. In the second case the milk returned after one month's weaning, and in the third, after the child had ceased taking the breast for the space of *four months*.

TO CORRESPONDENTS.

"A. B." Will oblige by sending his address.

Mr. Thorowgood will receive a note from us.

Numerous other correspondents answered by post.

Notice—[As we have heard of more than one instance in which books sent to us for review have not reached us, we shall feel much obliged if those who have sent us books, of which we have not acknowledged the receipt, will communicate with us on the subject.]

NOTICE.—*All Communications, Books for Review and Substance for Notice must be addressed* "To the Editors of THE CHEMIST, care of Messrs. W. & T. Piper, Paternoster Row, London." *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following No. will in future be received as late as the 20th.*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

CHEMICAL ANALYSIS OF THE WATER OF THE DEAD SEA AND OF THE JORDAN.

BY MM. BOUTRON CHARLARD AND O. HENRY.

M. DUMERIL sent us, some months ago, two bottles, one containing water of the Dead Sea, the other water of the Jordan, both brought by M. Alphonse Dunoyer, vice consul, with a request that we would analyse them.

The first was labelled—

"Water of the Dead Sea, taken at two hours' march from the Jordan, on the western shore, on the 2nd of April, 1850, in the presence of M. Alphonse Dunoyer, acting vice consul of the consulate of Jerusalem, under whose care it was placed."

The second bottle was labelled—

"Water of the Jordan taken from that river on the 2nd of April, 1850, at the place to which pilgrims generally go, and which is about two or three hours' journey from the mouth."

These two bottles were accompanied by some fragments of rock, covered with a bituminous deposit, collected on the shore of the Dead Sea, and bearing the same date.

Although the water of the Dead Sea has been at different times the subject of analytical examination published in scientific works, the great difference existing in the weight of the residues and the nature of the salts of which they were formed, made us seize with avidity on the opportunity which offered of making a fresh analysis of this water, and of endeavoring to explain, if possible, the difference between the results of the chemists who had preceded us.

Our work is rendered the more appropriate by the excursion on the borders of the Dead Sea undertaken in 1851, by M. de Saulcy, member of the Academy of inscriptions and *belles-lettres*, the account of which he read at the annual public sitting of the Institute, on the 22nd of August last.

Amongst the picturesque descriptions which this gentleman gives of the places which he visited, we find some details respecting the Dead Sea which, by confirming some of those collected by other travellers, give a fresh degree of interest to his recent exploration.

If we confine ourselves exclusively to the traditions contained in the Bible, traditions which were reproduced in the relations of the travellers in the sixteenth and seventeenth centuries, the Dead Sea, which was formed in the cataclysm which overwhelmed the cities of the Pentapolis, would be a pestilential accursed lake, the exhalations from which caused death, and on the shores of which no kind of vegetation would be found. This belief is still so far spread among the pilgrims who go to Jerusalem, that they are content with touching this country of desolation, and hastening away with all speed. But as M. de Saulcy says, with much truth, we are now arrived at a time when religion has nothing to fear from the progress of science, and we can now, without being accused of impiety, admit that some of the marvels told of the Dead Sea would disappear before a severe and judicious examination.

According to M. de Saulcy, the vegetation

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is very fine on those parts of the Dead Sea where there is any fresh water. The water of this sea is very salt and of an odious taste, but very limpid. It is nearly saturated with the salts which are held in solution in it, for, on leaving the shore, the waves are covered with a crystalline crust, which is seen plunging rapidly into the depths.

No animal can live in this water, and all that has been said about the shells found on the shores of the lake by some travellers must certainly refer to the menalopsides which thrive in all the springs found on this shore.

On the beach are found pieces of bitumen and sulphur, but the first proceed from the chain of calcareous bitumen which extends along the eastern coast; the others are found in the hillocks of volcanic cinders on many points of the coast and in the proximity of craters.

Finally, far from perishing asphyxiated by the exhalations of the lake, on the contrary, aquatic birds swim in it with extreme facility, and without any appearance of suffering.

If then we examine without prejudice the great phenomena of which this portion of Syria has been the theatre, we may, with the aid of our scientific knowledge, attribute the destruction of the five criminal cities spoken of by Scripture, and the formation of the Dead Sea itself, to simultaneous or successive volcanic eruptions; the barrenness of its shores to the want of fresh water, which is so necessary and so fertilising under a burning climate; the complete absence of animals from this water to its saltness, which is incomparably more powerful than that of any known sea: finally, the insalubrity of the place to the alternate hot sun and thick fogs, which, by diminishing the vital energy, render the least imprudence or immoderate fatigue almost certainly fatal.

We regret that the limits to which we are forced to confine this preliminary note will not permit us to give fuller developement to these opinions, which have been suggested to us by the travels of M. de Saulcy, and we should be very glad if the analytical work which follows might serve as a sequel to the interesting account which he has given of this place.

WATER OF THE DEAD SEA. — ANALYSIS.

After a voyage which Pocock made to the Holy Land and Syria towards the middle of the last century, he brought with him some of the water of the Dead Sea, of which he had an analysis made in London; but we have not found the result mentioned in any work.

In 1778, Lavoisier, Macquer and Sage, made an examination of the water of the Dead Sea, and demonstrated that the water contained in 100 pounds, 44 pounds 6 ounces of salts, namely, 6 pounds 4 ounces of sea salt, and 38 pounds 2 ounces of sea salt with an earthy base.

Malte Brun, in his *Annales des Voyages*, devotes the following lines to the properties of the water of the Dead Sea:—"The specific gravity of the water is 1211, that of water being 1000; it is perfectly transparent. Reagents proved the presence of hydrochloric acid and sulphuric acid; there is no alumina; it is not saturated with sea salt, and it has no action on litmus or violet. It holds the following substances in solution in the proportions mentioned:—

	Per cent.
Muriate of lime	3·920
,, magnesia	10·246
,, soda	10·360
Sulphate of lime	0·054
	24·580

"These substances therefore form one-fourth of the weight of the water, in a state of perfect dessication. Mr. Gordon, who brought the bottle of water which was subjected to analysis, states that men float in the waters of the Dead Sea without having learned to swim."

In 1809, Klaproth also made an examination of this water; he assigned 1245 as its specific gravity, and found that it was composed of:—

	Per cent.
Muriate of magnesia.....	24·20
,, lime.....	10·60
,, soda	7·80
	42 60

M. Gay-Lussac, who, in 1819 examined the water of the Dead Sea which Count de Forbin had himself taken from it and which he brought back with him on his return from his voyage to the Levant, found its density to be 1228, and he obtained a residue of 26·24 per cent., composed of chlorides of sodium, calcium, magnesium, potassium, and of traces of sulphate of lime.

In the fifty-fifth volume of the *Annales de Chimie et de Physique*, (1827), we find an analysis of the water of the Dead Sea by C. G. Gmelin. This chemist, who took the density of the water, gives it as 1212, and he establishes its composition in the following manner: —

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	Per cent.
Chloride of calcium	3·2141
,, of magnesia	11·7734
Bromide of magnesium ..	0·4393
Chloride of sodium	7·0777
,, of potassium ..	1·6738
,, of aluminium ..	0·0896
,, of manganese ..	0·2117
Sal ammoniac	0·0075
Sulphate of lime	0·0527
	24·5398

Finally, we find in the *Annales des Mines* two analyses of the water of the Dead Sea, one by Lieutenant Ivanoff, (1840), of a sample brought by M. Teplia Koft, the other made by Dr. Apjohn; but the quantity of salts indicated by these analyses is so small that there can be no doubt that there must be an error in the numerical indication of the results. Moreover, these analyses teaching us nothing new, we have not endeavored to find out on what quantity of water these chemists operated.

Without pretending that those which we are about to report are the only analyses which have been undertaken on the water of the Dead Sea, it will suffice to compare the results indicated to see that there is a very considerable difference in the quantity of the salts obtained by means of evaporation, an operation which is so simple and so easy to execute that it is impossible to suppose that it can give rise to error. Moreover the names of Lavoisier, Klaproth, Gmelin and Gay-Lussac, carry with them a guarantee of accuracy, so that it is necessary to seek elsewhere for the causes of these differences.

The water sent to us was contained in a tin bottle, very full, and the neck of which was closed by a plate of the same metal, soldered to the tin.

Although the water was clear when poured out of the vessel, it was filtered so as to obtain it quite limpid; it presented the following characters: it was inodorous; its taste was salt and bitter; when heated it was slightly troubled, showing an ochreous cloudiness. The specific gravity, compared to that of distilled water, was 1099·16. Without action on litmus, it caused the color of the violet to turn green, especially after having remained some time in contact with it; when treated by acids there was no effervescence; baryta caused a slight cloudiness, whereas acid nitrate of silver caused an abundant curdy precipitate. Phosphate of soda, ammonia and oxalate of ammonia disclosed the presence of salts with a base of lime and of magnesia; protosulphate of iron, with the addition of hydrosulphuric acid, occasioned a greyish cloudiness, and alcohol and solution of soap, white deposits.

The mother liquors proceeding from the evaporation, treated with alcohol and evaporated almost to dryness, gave rise to a product which became of an orange yellow by the addition of a small quantity of sulphate of brucine. Finally, chloride of platinum indicated in the product of the water, concentrated into a small volume, the presence of potassa.

Without entering here into all the minute details which a quantitative analysis always requires, we will apply ourselves only to making known the principal experiments on which we have founded the results which we have deduced from our work.

120 grammes of the water of the Dead Sea subjected to a careful evaporation, gave in three experiments, a residue of a greyish color, weighing when dry 17·92 gr., that is to say, 149.33 gr. per thousand grammes. This saline residue was very deliquescent, a property owing to the great quantity of chlorides of calcium and magnesium which it contained.

Another portion of water, weighing 120 grammes to which was added a slight excess of acid nitrate of silver, gave a precipitate of chloride of silver which, when fused weighed 38·8 gr. The concentrated acid liquor, after being filtered and nearly saturated by means of ammonia, gave rise to such slight cloudiness that we hesitate to attribute it to the presence of a phosphate.

With the view of ascertaining whether the water of the Dead Sea contained an ammoniacal salt, as indicated by Gmelin, we distilled 60 grammes adding to it some fragments of alcholised potassa, the product of the distillation examined with care gave us no ammonia. The residue in the still was a white precipitate formed of lime and magnesia; the liquid portion separated by means of filteration, evaporated to dryness and redissolved in alcohol at 40° carefully tested by starch and pure nitric acid in excess, gave no indication of iodine.

Finally we poured a slight excess of nitrate of silver into 60 grammes of the water of the Dead Sea; the precipitate, washed and put into a capsule was mixed with pure metallic zinc and sulphuric acid. After the reaction, the zinc being always kept in excess; the whole was thrown on a filter. The liquor when concentrated into a small volume was introduced into a narrow test glass, a little fresh solution of starch and sulphuric ether were added, then by means of a pipette some chloruretted water made at the moment was dropped in; it was shaken and the test glass left to

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repose. After some minutes the supernatant ether was colored of a clear yellow by a very small portion of bromine. The amylacious portion had not assumed either a blue, violet or roseate tint, for these three tints are met with according as the quantity of iodine contained in the water is more or less considerable.

We repeated this experiment a great number of times, with known artificial mixtures containing only a milligramme of bromide, a milligramme of iodide of potassium and five decigrammes of chloride of sodium, and we always obtained the colorations mentioned above. This process is so simple and so easy to put in practice that we are persuaded that it will be used before long in the analysis of mineral waters, when it is desired to ascertain whether these waters contain bromides and iodides, and with a little habit it would be possible even to estimate approximatively these two products. *

The experiments which we have made on the water of the Dead Sea cause us to establish its composition in the following manner for 1000 grammes of water.

	Grammes.
Chloride of sodium	110·03
" of potassium	1·66
" of magnesium	16·96
" of calcium	6·80
Sulphate of soda, magnesia and anhydrous lime.....	2·33
Earthy carbonates	9·53
Silica and organic matter ...	2·00
Bromide, nitrate, oxide of iron	traces
	149·31

Do the carbonates of lime and magnesia and sulphate of lime mentioned amongst the salts contained in the water, really pre-exist in it or are they the result of the reaction between an alkaline carbonate and the soluble calcareous and magnesian salts? We had too small a quantity of water at our deposal to ascertain this fact. However it be, in the hypothesis that the earthy carbonates exist in the water, we must suppose that they are in the state of soluble bicarbonates.

If we now compare the total weight of the residue obtained in our experiments with those mentioned by our predecessors, we are astonished at the enormous difference which exists between them. Thus, whereas Lavoisier, Macquer and Sage in 1778, later Klaproth in 1809, found that the water of the Dead Sea contained more than 40 per cent of its weight of salts; and whereas Gmelin and Gay-Lussac afterwards found that this water gave a residue of 24 and 26 per cent, we now find only 15.

To what must we attribute such an anomaly?

On reading with attention the relations' of the travellers who have written on Syria and the Holy Land, amongst others Father Nau, Thevenot, Shaw and Volney, we find, that in the rainy season, which occurs for the spring, in the months of March and April and for the autumn, in the month of October, the Jordon overflows, and the seven or eight torrents, which come from the neighbouring mountains, of which the Cedron and Arnon are the most important, bring to the Dead Sea a considerable quantity of fresh water which, mixing with the water of the lake, diminishes its saltne ss and density. When the rains, which last from twenty-five to thirty days, cease, the Jordan returns to its own bed, and the torrents cease to flow, the temperature which quickly rises causes an evaporation which by lowering the amount of water in the lake, induces in a short time a concentration of the liquid and augments its specific gravity.

This meteorological effect, which is reproduced each year with a periodicity about which all climatologists agree, show that it is essential when taking water for the purpose of examination, to note the time of year when it was taken.

Now when we observe how near the time at which M. Dunoyer took the water which has served for our experiments (2 April 1850,) is to the time of the spring rains we can no longer doubt that the water of the Dead Sea experiences at this period of the year a great diminution in its saltness, and consequently in the residue which it leaves on evaporation.

If the water of the Dead Sea contained, like that of the lake Elton,* a large proportion of sulphate of magnesia, we might think that a phenomenon took place analogous to that mentioned by Pallas, who assures us that the Epsom salts contained in the water of this lake are deposited during the night and redissolve during the day. But besides that the water of the Dead Sea contains but a small quantity of this magnesian salt, M. Gay-Lussac has subjected them to a very considerable dimi-

* For the estimation of bromine, we may also use the process employed by M. Figuier see "THE CHEMIST" February 1852 pp. 193, 244.

* Elton, Altan, Alton-nor, a large lake in Asiatic Russia, to the east of the Volga, forming part of the government of Saratov.

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nution of temperature without the separation of any salt being manifested.

Thus it appears to us certain that it is to the enormous mass of fresh water poured in at certain times of the year by the Jordan, and the torrents which flow into the Dead Sea, that we must attribute the varying proportions of salts obtained from this sea by the several Chemists who have hitherto examined it.

WATER OF THE JORDAN.

The Jordan is celebrated not only in the Holy Scriptures by the baptism of Christ, it is likewise held sacred among the Arabs and Turks who retain many Hebrew and Christian traditions; the first derived from Ishmael whose country is still inhabited by the Arabs; the others have been introduced among the Turks through the fables of the Kuran.

The Jordan rises in the Djebel-el-Chaïch (anti-Lebanon) near Cesarea Philippii, flows towards the south, traverses the lake Semechon about twenty two kilometres from its rise, then the lake of Tabarieh or Tiberius, and flows into the Dead Sea after a course of about one hundred and sixty kilometres. Its waters are of a lemon yellow color when viewed from the two banks. This little river varies in depth according to the season; its width is from 40 to 50 metres, its banks are covered with rushes.

On returning from the journey to Syria and Jerusalem which the count de Forbin made in 1817 and 1818, he brought some of the water of the Dead Sea, and of the Jordan, of which M. Gay-Lussac made an examination. We have mentioned above the weight and nature of the salts which he obtained from the water of the Dead Sea, but in the case of the water of the Jordan he was satisfied with simply testing it with reagents, and he concluded from his work that this water contained chloride of sodium, chloride of magnesium, a very small proportion of sulphate of lime and traces of chloride of calcium.

The water of the Jordan which we have examined was limpid, almost tasteless its odor slightly resembled petroleum, its specific gravity is 1000·84. The test by reagents indicated in this water the presence of chlorides, alkaline carbonates, a small quantity of sulphates and traces of a salt of potassium in the concentrated product. The water subjected to the action of heat became slightly cloudy towards the end of the evaporation. In this state it was without action on litmus, but it caused violet to become geeen. The experiments which we tried led us to consider that the water of the Jordan was composed of:—

(In 1000 grammes of water,)

	gr.
Chlorides of sodium	0·525
" of magnesium	0·250
" of potassium	traces
Sulphate of soda }	0·075
" of magnesia }	
Earthly bicarbonates	0·152
Silica ..... }	
Nitrogenous bituminous } ..	0·050
organic matter ..... }	
	1·052

STONE AND PEBBLE GATHERED ON THE BANK OF THE DEAD SEA.

The first of these concretions, which had a great analogy to travertin, was of a conchoïdal texture and very hard. It was formed of white, yellow and blackish layers, which when examined with a microscope, had a crystalline aspect. When reduced to powder in an agate mortar, it exhaled no odor when cold, but when heated in a tube it diffused a combined odor of animal matters, bitumen and garlic.* It effervesced with acids. This concretion was composed of:—

Carbonate of lime.—For the greater part.
Carbonate of magnesia.
Sesquioxide of iron.
Silica.
Sulphate of lime } in small proportion
Chloride of Sodium. }
Nitrogenous bituminous organic matter.

The pebble was nearly the size of a fist, of a black color almost all over the surface. This species of plaster, which was detached by means of a sharp instrument in the form of scales, was reduced to powder. Subjected to the action of dilute hydrochloric acid, it gave rise to a slight effervescence due to a small quantity of carbonate which still remained adherent. The residue when washed, dried and redissolved by boiling alcohol scarcely left any thing. When put on burning charcoal, it burned with a very bright flame and diffused a fetid alliaceous odor.

Introduced into a tube closed at one extremity and strongly heated, this matter softened a little, then decomposed into pyrogenous, oily, brown and yellow products, of a very disagreeable sulphurous odor, moreover giving ammoniacal vapors.

These characteristics should make us regard it as having much resemblance to the bituminous substances which accompany certain species of schistous and calcareous stones.—*Journal de Pharmacie et de Chimie*, March, 1852.

* This odor of garlic is not due to the presence of any arsenical compound.

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ON IODIDE OF STARCH, ITS DECOLORATION BY HEAT AND VEGETABLE CHARCOAL, AND THE ACTION OF IODINE ON CHARCOAL AND SAWDUST.

BY M. MAGNES LAHENS.

I. On Iodide of Starch considered as a Pharmaceutical Product.

I published some months since, in the *Journal de Médicine de Toulouse*, a memoir on soluble iodide of starch, which afterwards appeared in several journals in the capital. Notwithstanding the criticisms of M. Brun-Buisson, who limits himself to stating that in his case my process, although adopted by many other pharmaceutists, did not succeed; and notwithstanding the sharper remarks of M. Quesneville, or rather on account of his interested criticisms, which are without foundation*, I feel confident of having successfully reproduced the iodide of M. Quesneville's secret formula.

I have since thought that a product might be obtained, if not superior to the iodide of M. Quesneville, at any rate answering better to the name given by this chemist to his compound, and I have prepared an iodide of starch, not with torrified starch, but with common starch slightly moistened in the following manner: iodine, one part; starch, slightly moistened, nine parts.

Having thoroughly mixed these two substances, I introduced them into a glass mattrass, which I closed and heated for several hours in a bath of boiling water, agitating the substance very frequently.

The product of this operation, which I referred to slightly in the memoir just alluded to, is in great part soluble in cold water, and entirely dissolves when subjected to the heat of a bath of boiling water. The solution is of an almost pure blue color, of great richness, and has far less of the violet tint than that obtained with M. Quesneville's iodide.

Both the processes employed have the great disadvantage of yielding products having the odor and flavor of iodine, which, however slight, are detected by sick persons. Washing with alcohol diminishes this objection, but does not entirely remove it. The same complaint may be made of the product of M. Quesneville. A bottle of iodide of starch from the laboratory of this chemist gave off, in the space of a few months, sufficient iodine to impart a deep yellow colour to the cork which closed the bottle.

Struck by these objections, I have prepared a medicament analogous to iodide of starch, which appears to me to possess its advantages without partaking of its defects. I shall presently allude to it, and will give the formula for it, preferring to the profit which I might derive from it the pleasure of benefitting my cotemporaries.

Before proceeding further, I think it will be useful to mention what I have recently observed during the washing of iodide of starch with alcohol. This washing, which I had adopted in the first instance, on the authority of M. Quesneville, should now, I think, be rejected, for the following reasons:—

The first affusion of alcohol brings over a certain quantity, not of pure iodine, as M. Quesneville appears to think, but of strongly iodurretted iodide of starch. To be convinced of this, it is only necessary to add a few drops of solution of caustic potassa to the yellow alcoholic liquor to form a tolerably abundant white precipitate of starch. A second affusion of alcohol produces the same result, and this will continue until there only remains on the filter a slightly iodurretted starch of a reddish tint; the washings by boiling alcohol finish by depriving the starch of its iodine.* I repeated the same experiments on the insoluble iodide of starch of M. Bonnewyn, and the results were nearly the same. But the starch of this latter iodide remaining on the filter is almost insoluble in water, while the starch of the soluble iodide participates in its solubility in that menstruum.

The yellow color which the alcohol assumes on contact with the iodide of starch might hitherto have caused it to be thought that this solution only carried off the iodine. This error would have been avoided if a certain quantity of water had been added to the solution. Water gives it a violet-rose color, denoting the presence of starch, which is furthermore proved by the above-mentioned use of caustic potassa. I have shown that the iodide of M. Bonnewyn and that of M. Quesneville, which differ, as is known, in the quantities of iodine, also differ in the nature of the starch which they

* M. Quesneville did not take the trouble to repeat my process before declaring it a bad one. He based his judgment on the authority of Brun-Buisson, whom he ridicules a few lines afterwards, not perceiving that he thus destroys the only support of his own argument.

* What now becomes of M. Quesneville's statement that the washing by alcohol only carries off the iodine existing in a free state in the iodide?

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contain; this might readily have been foreseen. But, moreover, the starch which is contained in the iodide of M. Quesneville is not in a uniform state. If this iodide of starch be successively treated by alcohol at 40°, by alcohol at 21°, and by water, the products of these three washings separated, and then the starch of the alcoholic liquors precipitated by potassa, it will be found that the first precipitate assumes a rose color on the addition of iodurretted water; the second becomes violet, whilst the aqueous solution is blue.

II. On the Action of Heat on Iodide of Starch.

The authors who have studied the peculiar property possessed by the solution of iodide of starch, of becoming decolored by the application of heat, have not always taken the pains to indicate the process followed in preparing the iodide of starch on which they experimented. They have, moreover, operated on solutions containing but a small proportion of iodide of starch, for want of means to obtain any more concentrated. This twofold cause renders their statements on the subject less decisive and less susceptible of rigid exactitude than would otherwise have been the case.

In my experiments on iodide of starch I used a solution prepared according to my first process.

I dissolved ten grammes of it in 250 grammes of distilled water, and heated the solution in a glass mattrass to the boiling point; some time before boiling the liquor gave off a large quantity of iodine; after boiling for three minutes it lost its fine blue color, and assumed a slight color of dead leaves; it was distinctly acid. Cooling reproduced the primitive blue color, but less intense, and approaching a violet tint; the liquor again boiled for three minutes, gave off abundant vapors of iodine, lost its color, and became more acid. When cool it assumed a vinous violet shade; a third boiling for three minutes again caused a disengagement of iodine from the liquor, decolored it more completely, and rendered it more acid; it became of a dirty rose tint when cool. Finally, a fourth ebullition of three minutes no longer disengaged iodine, but increased the acidity. Even after the lapse of an hour cooling did not modify the dead leaf color produced by the application of heat; but nearly two months after the operation I have just described the liquor had become of a vinous violet color, and at the bottom of the bottle there was a slight violet-blue deposit.

Was the acid formed in this experiment hydriodic acid? Several authors having denied its formation under similar circumstances, whilst others were of a contrary opinion, my first endeavor was to solve this difficulty.

I poured into a tubulated retort a certain quantity of solution of iodide of starch, which had been heated for a time sufficient to prevent change of color by prolonged cooling; to the stopper of the retort were suspended a leaf of silver and a piece of moistened litmus paper. I applied heat, and about three parts of the liquor distilled over without presenting any remarkable phenomenon; but then the litmus paper became red, while the silver retained its brilliancy; afterwards the liquor became slightly yellow. I then withdrew the fire; the residue of the distillation was very acid, precipitated nitrate of silver very abundantly, became of a reddish yellow color on the addition of chloruretted water, and threw down a very finely divided black powder on further additions of chloruretted water. A large quantity of this reagent, however, caused the black precipitate to disappear, and decolored the liquor; a drop of this liquor tested with starch-paste before the addition of the excess of chloruretted water became of a deep violet color. By these characteristics it was impossible not to recognise hydriodic acid.

It now remains to determine if it is from the water or from the starch that the iodine derives the hydrogen to form this acid. For two reasons it appears to me that the hydrogen is furnished by the water:—1. The contact of water and iodine produces hydriodic acid. This fact, first made known by Gay-Lussac, then verified by M. Lassaigne, has also been observed by myself. 2. In the modifications which starch undergoes under the influence of iodine, in passing first into dextrine and then into glucose, instead of losing its hydrogen it absorbs the elements of water. This results from the comparison of the formulæ of starch and glucose.

I have just stated, that under the prolonged influence of heat iodine converts starch into glucose. The following is the experiment on which I found my assertion:

I dissolved ten grammes of iodide of starch in 250 grammes of water, and heated the liquor for several hours, replacing the water as it evaporated: I then concentrated the liquor, which had become very acid, and afterwards saturated it with potassa. By means of concentrated alcohol, I removed the iodide of potassium which was formed, and there remained a pitchy mass which

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behaved itself like glucose when treated with lime-water and Bareswil's solution. Still this mass was but slightly sweet, and contained dextrine. I now asked myself if the dextrine, formed, in the first instance, under the influence of iodine, had been directly converted under the same influence into glucose, or if it had passed through the intermediate state of cane-sugar. I have vainly endeavored, by numerous experiments, to reply to this question. Nevertheless, the transitory appearance of cane-sugar does not appear to me to be unlikely, especially as I have proved, as stated in the memoir mentioned at the commencement of this paper, the transformation of cane-sugar into glucose under the influence of iodine and heat. This conjecture is further supported by an assertion made long since by M. Dumas, to the effect that when the reaction of diastase on starch could be stopped at the proper period cane-sugar might be produced. There is yet another point to be elucidated relative to the formation of the glucose; it would be interesting to ascertain if glucose is really formed by the action of iodine, and if it would not be more correct to attribute its formation to the hydriodic acid which incessantly replaces the iodine.

I now have to explain the disappearances and return of the color in the solution of iodide of starch, heated and cooled alternately several times. The disappearance of the iodine and the production of the hydriodic acid are the most ready means of accounting for the decoloration, but these are far from explaining the whole. If, indeed, these acted alone, we should only find starch and hydriodic acid in the liquor, and the color would not return. Is there an iodide of starch formed, colorless on account of an excess of starch, as has been thought by certain chemists? M. Lassaigne has successfully refuted this supposition, which, although it readily accounts for the decoloration, renders inexplicable the return of the color. It is more natural to think with the chemist whose authority I have just quoted, that the solution of iodide of starch, when under the influence of heat, assumes a peculiar arrangement of its molecules, which permits all luminous rays to pass freely through the liquid mass without coloring it, and that the color reappears when cooling modifies this arrangement.*

If the fact of the disappearance and return of color, which, according to the explanation here given, ought to be indefinitely prolonged, should notwithstanding cease, this might arise from the circumstance that the elements of the iodic compound separate or alter by the frequent application of heat. It is on account of the gradual disappearance of iodine and predominance of the starch, which passes more and more into the state of dextrine, that the successive colorations degenerate from blue to violet, and ultimately to a dirty rose color.

III. ON THE ACTION OF CHARCOAL ON IODIDE OF STARCH AND ON IODINE.

Having seen in a memoir of M. Lassaigne, whose works on iodine I have consulted with much advantage, that iodide of starch is decolored by animal charcoal, it occurred to me to try the action of wood charcoal on this substance. The experiments I have made with this view have succeeded, and the decoloration of the solution of iodide of starch by means of vegetable charcoal was effected with ease and promptitude at the ordinary temperature. The charcoal absorbed the whole of the iodine by separating the starch. I then conceived the idea of combining directly iodine and charcoal in such proportions as should form a compound which might replace in therapeutics the iodide of starch of M. Quesneville, the disadvantages of which I have above alluded to; the combination succeeded very well; experience will prove if my aim, in a medicinal point of view, has been attained.

The ioduretted charcoal which I obtained is free from the taste and odor of iodine.

Although under ordinary circumstances more stable than iodide of starch, it appears to me that it would very easily decompose under the influence of the moist heat of the stomach and vital forces. If it cannot be prepared as a syrup, it may readily be made

* The following observation further supports this explanation:—Many acids, and especially hydrochloric and oxalic acids, do not exert any chemical action on iodide of starch; it is only known that their contact gives so powerful cohesive a property to the starch as to cause it to precipitate from its aqueous solution. If, then, the return of the blue color is facilitated by these acids, in a solution of iodide of starch decolored by heat, may we not conclude that by destroying the arrangement of the molecules formed by the application of heat, they restore the color? Thus I would admit, without difficulty, that the color which reappeared after the lapse of two months, in my solution of iodide of starch long exposed to heat, was due to the action of hydriodic acid and time, which had both contributed to destroy the molecular arrangement which prevented the manifestation of color.

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into pills and tablets; these two latter forms are quite as good as the former. The following is the manner in which I operated to obtain my ioduretted charcoal, and the remarks which I made on the occasion:—

	grammes.
Willow charcoal, washed and reduced to fine powder.....	9
Iodine	1*
Distilled water	108

After a few minutes' trituration in a porcelain mortar, the whole was placed on a filter, and the water passed through perfectly colorless and free from the flavor of iodine. It only colors starch-pasts when chloruretted water is added. Evaporated to dryness it leaves a residue weighing about one decigramme. This residue raised my curiosity, especially as I had washed the charcoal in a large quantity of water to remove the carbonate of potassa contained in it, and thus prevent the formation of iodide of potassium. As in the case of the liquor, the residue tested with starch-water did not become blue, but the addition of a small quantity of chloruretted water immediately produced a fine blue color. The addition of a drop of concentrated sulphuric acid produced the same result. Heated for an instant at a red heat, the residue gave off abundant vapors of iodine. Cooled, and again tested by chlorine and starch-water, it became blue. Heated a second time to a red heat, but for a longer period, it still gave off vapors of iodine, but weaker. After this the reagents no longer denoted the presence of iodine. It became of a brilliant white, and was found to be quick-lime. The residue then, the chemical properties of which I have just described, is iodide of calcium, and the lime is evidently derived from the charcoal in which it would be found in the state of carbonate of lime.

In order to prevent the formation of iodide of calcium in the preparation of ioduretted charcoal, it would suffice to wash the charcoal first with hydrochloric acid, and then with water.

I dried the ioduretted charcoal in a moderately heated stove, but notwithstanding the slight elevation of temperature, the iodine, aided by the vapor of the water, was in part given off.

Seeking to remedy this inconvenience, I intimately mixed one part of iodine with nine parts of dry charcoal, only retaining its hygrometric water, so as to avoid having to dry the product. I succeeded better than I had anticipated, the product having neither the flavor nor odor of iodine, and having washed it on a filter I ascertained that the water which passed through was inodorous and colorless, and did not give a blue color to starch paste.

From what we have seen it appears that to obtain charcoal ioduretted to the extent of a tenth part of iodine and free from iodurets, we should use vegetable charcoal washed first in hydrochloric acid and then in water, dried in the open air and simply mixed by means of trituration, prolonged according to the quantity of iodine.

The property possessed by vegetable charcoal of concentrating into a small volume a large proportion of iodine appears to me to be capable of useful application in the extraction of this metalloïd. This same property, might, on the contrary, become the cause of serious errors to those engaged in investigating criminal cases, who, after having decolored by means of charcoal the liquids suspected of containing iodine, would not think of again seeking for this substance in the charcoal used.

IV. ON THE ACTION OF IODINE ON SAWDUST.

I pounded in a porcelain mortar three grammes of fresh finely-powdered oak sawdust, with two decigrammes of iodine; the mixture assumed a fine reddish yellow tint, resembling that of Chinese rhubarb powder. I added by degrees some distilled water, still continuing to pound it, and after a few minutes I put the whole of it on a filter. The liquor had neither the odor nor flavor of iodine, it was of a fawn colored yellow, and did not color starch-water unless chloruretted water was added. Evaporated carefully to dryness, it did not give off any iodine. It was only when the heat was increased so as to slightly carbonise the residue that there escaped from the latter very abundant vapors of iodine. I then increased the temperature to a dull red heat, when a few scarcely perceptible vapors of iodine appeared; these soon ceased, and did not reappear even at a white heat; they arose from a small quantity of iodide of calcium. When tested by starch-paste and chloruretted water the residue assumed a bluish tint: it was almost entirely composed of lime and iodide of potassium.

* The proportions of nine parts of charcoal to one of iodine do not indicate the whole extent of the absorbent property of the charcoal. In the experiments which I have made, four parts of charcoal have absorbed one part of iodine; but two parts of charcoal did not absorb one part of iodine. But these proportions are not absolute, and doubtless vary according to the nature of the charcoal and its division.

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The disappearance of iodine from the time when the carbonisation of the residue takes place, induces me to think that the iodine is at least partially combined with some vegetable matter. This combination is sufficiently intimate, as I have before stated, to prevent starch from being colored. In which portion of the vegetable matter is the iodine combined? Is it in the ligneous fibre or cellulose? Evidently not; for I have experimented on cellulose and confirmed the statement of several authors to the effect that iodine is indifferent to the action of cellulose. Is it to the nitrogenous matter contained in the wood? of which M. Dumas in his *Traité de Chimie*, vol. vi., p. 4, says: "This nitrogenous matter assumes a yellow color, and contracts when an aqueous solution of iodine is added." I am the more inclined to support this opinion, as the sawdust assumed a reddish yellow color on contact with iodine.* But the whole of the iodine was not absorbed by this nitrogenous matter, as a portion was found in the liquor in the state of iodide of calcium and potassium.

The transformation of the salts of lime and potassa contained in the wood into iodides under the influence of iodine, appears surprising; nevertheless, it is probable, as we have already seen the carbonate of lime contained in charcoal decomposed by iodine. I wished, however, to make a direct experiment to ascertain whether acetate of potassa, taking it as an example of salts of organic acid, is decomposable by iodine. With this view I rendered slightly acid some acetate of potassa wishing thus to avoid an excess of base, which would have rendered my experiment less conclusive. I then poured a few drops of ioduretted water into a solution of acid acetate of potassa, agitated it briskly. When a solution of starch was added to this mixture it did not become colored; but the addition of chloruretted water caused it to assume a blue color. It appeares to me from this fact, and from the analogous facts before referred to, that we may conclude that the salts of organic acids and with potassa and lime bases contained in sawdust, are partially transformed into iodides under the influence of iodine.

In the course of the last-named experiment, I discovered a curious fact. If a few particles of iodine are pounded with dry acetate of potassa, the matter soon assumes an intense blue color. In the first instance I thought I might have accidentally introdued a small portion of starch into the mixture; but the same experiment repeated several times with the greatest care always produced this color. After the lapse of a few minutes the blue color disappeared by degrees, and the liquor which was formed by the absorption of the humidity of the air was yellowish.

To avoid the accusation of plagiarism, and not to claim a title which properly belongs to M. Emile Béchi, a chemist in Florence, who published a remarkable work on the combination of iodine and charcoal, in the July number of the *Journal de Pharmacie et de Chemie*, 1851, I must state that my researches on the subject were ended before I read the memoir of M. Béchi. I did not in any way alter my manuscript after reading his paper. In the first instance I thought of abstracting from No. 3 all that might cause me to be accused of plagiarism; but being conscious of my innocence on this point, and further, giving to M. Béchi the whole honor of the discovery of the action of iodine on wood charcoal, which he had the good fortune to publish before me, I left my manuscript entirely unaltered.

Besides, the object of my paper was essentially different from that of M. Béchi, and I only noticed as a corollary the possibility which I saw of applying, in the extraction of iodine, the affinity of this metalloïd for charcoal. Even had the purport of my researches been, not the dis-

* This great affinity of iodine for nitrogenous vegetable matter would explain the extreme richness in iodine of the fuci, confervæ, lichens, &c., which are considered to be some of the most nitrogenous vegetables. On the other hand, the combination of iodine and the nitrogenous matter, which I am now studying, being destroyed when the carbonisation of the compound commences, have I not some right to infer that the iodine is in the state of metalloïd? and may we not naturally presume, in common with certain authors cited by M. Dorvault, but whose memoirs I do not know, that in the fucus the iodine is also in that state. If we further consider that it is scarcely probable that the fucus limits itself to the absorption of the iodides as contained in sea water, but that, on the contrary, it is more natural to believe that the fucus decomposes them to appropriate to itself the iodine, in the same way that vegetables generally absorb carbonic acid, ammonia, and the silicates, to appropriate carbon, nitrogen, and silica, I may be pardoned, I hope, for having revived an opinion which has been combatted, it is true, with much talent by M. Dorvault, but which, notwithstanding, appears to me to be retainable.

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covery of a new medicine capable of replacing the iodide of starch, but the extraction of the iodine, I should not, I think, have adopted the rational, although very complicated, process of M. Béchi, but should have endeavored to find more simple and direct means for the attainment of my object. In the first place, I should have tried a method practised by saltpetre-makers, of entirely saturating the charcoal with iodine; this substance, as I have before stated, easily combines with four parts of charcoal. This composition, so rich in iodine, would then have been treated by concentrated sulphuric acid, so as to convert it into iodine, and into carbonic and sulphurous, acids or I would have burned the whole of the carbon of the iodurette charcoal, by passing into a suitably disposed distillatory vessel a sufficient current of air to burn the carbon, and thus liberate the iodine; and if these two processes did not succeed, I should have preferred the hydrated ferruginous oxide; and the manipulations of this choice would have necessitated the employment of caustic potassa, (also indicated by M. Béchi, although less prominently) because the treatment of iodurette charcoal at a high temperature in the open air yields iodide of potassium, which is preferable to iodine in an economical and commercial point of view. Indeed, as is well known, nearly the whole of the iodine extracted in the manufactories is now transformed into iodide of potassium.—*Journal de Pharmacie et de Chimie, January*, 1852.

ON NITROUS ACID.

BY M. FRITZSCHE.

In 1840 M. Fritzsche published some observations on nitrous acid, and was the first to announce that this acid could be obtained in an isolated state under the form of an indigo blue liquid, and very volatile. The analysis of this blue liquid not having yet been made, the author has thought fit to fill up the void.

He obtained a great quantity of nitrous acid in the following manner. In the experiments tried on a large scale at St. Petersburg on lighting by the electric light, a large battery was charged with nitric acid, which assumed a blue color towards the end of the experiment, owing to the presence oi nitrous acid. Twenty pounds of this nitric acid were subjected to distillation, and the nitrous products which disengaged themselves were directed into refrigerators surrounded with a mixture of crystallised chloride of calcium and snow.

Several ounces of a deep green liquid were thus obtained, possessing all the properties of a mixture of nitrous acid and hyponitric acid. Subjected to renewed rectifications at very low temperatures, this mixture readily furnished a liquid of a fine indigo blue, which was nitrous acid, as pure as it can be obtained.

The author analysed this acid by the following process. The acid destined for analysis was distilled anew, and received into glass tubes terminating in bulbs, and the weight of which was exactly known. As soon as a sufficient quantity of acid had collected in the bulb, the upper part of the tube was hermetically sealed, and the augmentation in the weight of the little bulb containing the nitrous acid was ascertained. The weight of this acid being thus determined, the little bulb was introduced into a flask filled with iced water in such a manner that the tube or neck of the little bulb, furnished with a stopper, was fixed to the neck of the phial, which it closed hermetically, and that the bulb containing the nitrous acid exactly reached the bottom of the flask. By causing a slight pressure on the neck of the little bulb, it broke, and the nitrous acid was dissolved in the water. During this solution M. Fritzsche always observed a disengagement of gas, and on uncorking the flask, after shaking it several times, he always found that some red vapors escaped. This circumstance necessarily occasioned a slight loss in the analysis; the numbers obtained are consequently rather too low.

After obtaining as just described a solution of a known weight of the blue acid, M. Fritzsche determined its composition by trying how much hypermanganate of potassa was necessary to transform the nitrous acid into nitric acid. For this purpose he used a solution containing one part of hypermanganate to 200 parts of water, and he added this liquor to the solution of nitrous acid, until it was decolored.

He obtained the following results:—

	Gr.		Gr.	
I.	0·416	required	0·650	of hypermanganate of potassa.
II.	0·315	,,	0·500	
III.	0·121	,,	0·190	

But as 1 equivalent of hypermanganate of potassa liberates 5 equivalents of oxygen, the quantities of this salt employed in the analysis correspond to the following weights of oxygen:—

	Gr.
I.	0·164
II.	0·127
III.	0·048

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Now, 1 equivalent of nitrous acid= 475·06, requires for its transformation into nitric acid 2 equivalents=200 of oxygen. The before-mentioned quantities of hypermanganate of potassa, therefore, transformed into nitric acid the following quantities of nitrous acid:—

		Difference.
I.	0·3895	0·0265
II.	0·3016	0·0234
III.	0·1140	0·0070

The second column explains the difference between the quantities of nitrous acid, calculated in the first column, according to the results of the experiment, and the weight of the acid employed. From what was said above on the disengagement of red vapors at the moment when the flasks were uncorked, it is not surprising that the analyses should show a loss which amounts to an average of 6·6 per cent. Moreover, we know that during distillation nitrous acid has a great tendency to decompose into binoxide of nitrogen and hyponitric acid, and it is therefore probable that the nitrous acid subjected to analysis contained a small quantity of hyponitric acid. In any case the analysis proved clearly that at least 93·4 per cent. of the blue liquor was formed of pure anhydrous nitric acid: $N.O^3$.—*Bulletin de l'Académie de St. Petersbourg.*

ON THE EXISTENCE OF METALLIC IRON IN FOSSIL WOOD.

BY M. BAHR.

M. Bahr, a pupil of M. Svanberg, had occasion to analyse some fos il wood from an isle in the lake Ralang, in Smaland, and the composition of which in some degree resembled that of iron ore.

On pulverising small quantities of this ore, the author observed some hard, tenacious grains, which gave way but little to the action of the agate pestle. These grains were nothing but metallic iron; they flattened under the hammer, were attracted by the magnet, and decomposed hydrochloric acid with a disengagement of hydrogen gas.

M. Bahr asked himself if this iron were formed in the midst of the wood by the reduction of some soluble salt of iron, or if it had been introduced in the state of metallic iron, under the form of a nail or of a piece of some instrument, which, after being partially rusted away, nevertheless left some traces of its presence in the metallic state.

After having examined and carefully sifted the origin, character, structure, and composition of the sample of this fossil wood impregnated with iron, the author has arrived at the conclusion that this iron was really deposited in the metallic state, and that the singular mineral which he had in his hands is the first well proved example of native telluric iron.

The following are some of the circumstances on which M. Bahr has founded his opinion.

The sample of fossil wood had been detached on the 28th August, 1798, from the largest extremity of a trunk in the floating island of the lake Ralang, in Smaland. This isle, after having been submerged for four years, had risen to the surface on the preceding day. To the extremity of this trunk were affixed two plates of copper, bearing an inscription destined to commemorate the time when this singular isle* had been visited by King Gustavus III.

M. Bahr had in his possession two fragments of this fossil wood, which in its external appearance greatly resembled a piece of iron ore. The density of one of the fragments was 3·854, that of the other 3·94. On cleansing their surface with the feather of a quill, metallic iron was perceived everywhere, penetrating the whole mass of the wood, and which appeared either as powder, under the form of little lamellæ, or in round or angular grains. This structure became more apparent with the assistance of a magnifying glass or microscope, which exhibited everywhere the fibres of the wood separated by pulverulent iron. In some parts the grains of iron were of an appreciable size, and united like the beads of a necklace. Five of these grains occupied the length of a millimetre. In some parts they became detached, leaving cavities similar to organic cellules. The density of this iron (which is probably mixed with organic matters) is very inconsiderable; in two experiments it was found equal to 6·248 and 6·4972. In a third determination made with a grain crushed by a hammer, the number found was 6·6255.

The author has analysed the grains of iron, freed as far as possible from organic substances. He dissolved them in very dilute nitric acid. The dissolved part, which amounted to 80·16 per cent. of the total weight of the grains, contained the following substances, calculated in the state of oxides:—

* This floating isle appears originally to have formed a tongue of wooded country, which was one day detached from the shore after having been completely undermined by the waters. Generally submerged, it appears on the surface for a few days, ordinarily in the month of August or September.

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	Per Cent.
Silica	0·818
Phosphoric acid	0·500
Nickel (with cobalt)	0·120
Lime and magnesia	0·178
Alumina	0·213
Vanadic acid	traces.
Manganese	traces.
Protoxide of iron (calculated by the difference)	98·171
	100·000

The residue, insoluble in very weak nitric acid, still contained some parts which were attracted by the magnet, which were subjected to analysis, and which contained the following substances, calculated in the form of oxide :—

	Per Cent.
Silica	0·619
Phosphoric acid	3·159
Vanadic acid	1·402
Oxide of nickel (with oxide of cobalt)	0·737
Oxide of iron	94·464
Manganese	traces.

Should other woods be found thus impregnated with iron, and should samples of them be placed in collections, the author proposes to designate them by the name of "Sideroferrite."—*Journal de Pharmacie et de Chimie*, March, 1852.

ON THE DIRECT PRODUCTION OF THE HYDRACIDS BY THE AID OF POROUS BODIES.

BY M. B. CORENWINDER.

When Döebereiner made known the remarkable power of exciting chemical action possessed by finely divided platinum, it was easy to see that this curious fact contained the germ of numerous discoveries, interesting for their scientific value, their possible application in industrial art, and the assistance they would give to the theory of natural phenomena.

Thus, all chemists know the advantage which M. Kuhlmann derived from the use of divided or spongy platinum in causing the curious reactions which enabled him to explain in a satisfactory manner the phenomenon of nitrification. It will be remembered that, among other important actions he proved the preparation of nitric acid by oxygen and ammonia, and reciprocally that of ammonia by hydrogen and nitrous combinations.

This memoir is intended to make known the results of some new experiments which I have made with porous bodies. I have succeeded, through their intervention, in combining hydrogen with different metalloïds, such as iodine, bromine, sulphur and selenium, which will not combine with it by the action of heat alone. When circumstances permitted it, I used spongy platinum; in cases where this latter body would be liable to alteration in contact with one of the metalloïds used, I replaced the spongy platinum by fragments of pummice stone.

By operating in this manner I have produced in a direct manner the following mineral hydracids.

With spongy platinum, hydriodic and hydrobromic acids.

With pummice stone, hydrosulphuric and hydroselenic acid.

I have likewise tried a great number of experiments with these same agents, but the results obtained have neither been sufficiently interesting nor unexpected to deserve mention. I must, however, mention this fact, that phosphorus and hydrogen are without action on each other when passed through a tube containing pummice stone gradually heated to redness. M. Kuhlmann proved some years ago that nitrogen and hydrogen would not combine under the influence of porus bodies. This is another analogy in addition to those which nitrogen and phosphorus have already presented in their relations with other bodies.

Hydriodic acid. Hitherto iodine and hydrogen have never been combined directly even by passing these two bodies simultaneously through a porcelain tube heated to redness; but if we cause the spongy platinum to absorb the vapor of iodine, and then subject this sponge to a current of dry hydrogen in a glass tube heated moderately, there is an immediate production of thick vapors of hydriodic acid mixed with an excess of hydrogen.

By operating thus the action is very limited, and a great quantity of uncombined iodine is carried off by the hydrogen; it is likewise better to put the vapor of iodine successively in contact with the spongy platinum.

Hydrobromic acid. It is well known that M. Balard has combined directly bromine and hydrogen by passing these two bodies simultaneously through a porcelain tube heated to redness. In these conditions the action is necessarily limited; I have been enabled to render it complete by using spongy platinum, and to produce in a short time very pure hydrobromic acid.

My apparatus consists of a glass tube filled with spongy platinum, to which I adapt a small retort containing bromine

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and a phial furnished with accessory tubes, to produce pure and dry hydrogen. The retort is placed in a water bath which is kept at a slightly raised temperature, and the tube is heated with moderation. If we operate carefully all the bromine is transformed into hydrobromic acid, which can be collected in water.

HYDROSULPHURIC ACID. By causing sulphur in vapor and hydrogen to pass through a tube containing fragments of pummice stone heated to about 752°F., hydrosulphuric acid is produced in abundance. The arrangement of the apparatus is the same as for hydriodic acid. Hydrosulphuric acid can be collected in an alkaline solution or in boiled water.

HYDROSELENIC ACID. The facility with which sulphur and hydrogen combined under the influence of pummice stone led me to foresee that it would be the same with hydrogen and selenium. By operating in the same conditions as the preceding, hydroselenic acid is obtained, recognisable by all its easily known characters.

These experiments show, in a synthetic manner, the composition of hydriodic, hydrobromic, hydrosulphuric and hydroselenic acids. Certainly no doubt remained as to the nature of the elements which form these hydracids, analysis had fully enlightened us on this subject; but it is evident that the interest of the science increases when proofs are multiplied and when the two methods of investigation, analysis and synthesis, conduct us to the same results.

The use of porous bodies in chemical reactions is deserving of serious attention; there is in these bodies a great and very inexpensive power, which enables us to moderate the action of caloric, and which will perhaps one day be introduced into the processes of arts and industry.—*Répertoire de Pharmacie*, February, 1852.

NEW RESEARCHES ON HYPERIODIC ACID AND THE HYPERIODATES.

BY M. LANGLOIS.

SINCE 1833, the period of its discovery by MM. Magnus and Ammermüller, hyperiodic acid has been very little studied. MM. Rammelsberg and Bengiesser have alone made some remarks on its preparation and on the composition of some of the salts which it originates when united to the metallic oxydes.

We have thought that it would be useful to complete this study by the determination of its state of hydratation, and by the examination of the salts which it is capable of forming, either with organic or inorganic bases.

Hyperiodic acid is a pentahydric acid, producing salts in which the 5 equivalents of water are replaced either partly or entirely by an equal number of equivalents of base. It is solid, and in very deliquescent prismatic rhomboïdal crystals. This last character, already noticed by M. Bengiesser, had not been recognised by the original discoverers of this acid. Before seeking the quantity of water contained in the crystals, we kept them for several days over sulphuric acid, in the vacuum of the pneumatic machine. They were then heated in an oil bath, in a tube sealed at one extremity. At the temperature of 266° F. they fused, and at from 392° to 410° F. they lost all their water and 2 equivalents of oxygen. There only remained iodic acid in the tube, the decomposition of which does not take place at this heat.

	Gr.		Per ct.
I.	0·1855 of matter lost	0.0495,	or 26·68
II.	0·2800	,, 0·0750,	or 26·78
III.	0·2850	,, 0·0780,	or 27·36
IV.	0·2502	,, 0·0675,	or 26·97

The mean loss in these experiments was 26·94 per cent. If we allow 5 equivalents of water to hyperiodic acid, 26·77 would be obtained, a number obviously very nearly approaching that furnished by experiments.

Crystallised hyperiodic acid, then, contains 5 equivalents of water, which may be replaced, in certain combinations, by 5 equivalents of metallic oxide. M. Rammelsberg has found this composition in the hyperiodates of baryta, strontia, and lime, obtained by exposing to a moderate heat the iodates of these bases. The constitution of hyperiodic acid accounts for this easy transformation of the iodates into quinquibasic hyperiodates.

This acid of iodine is instantaneously decomposed by sulphurous, hydrochloric, and hydrosulphuric acid. With regard to morphine, it behaves like iodic acid. After a short time of contact the iodine is set free, and a solution of starch will prove its presence. It precipitates a solution of tannin, which iodic acid does not. Ammonia and caustic potassa dissolve the precipitate, and the resulting liquor takes a deep red color, due to the oxidation of the tannin. The reduced iodine combines with the alkali. Gallic acid is not precipitated by hyperiodic acid, but the phenomenon of coloration is produced as with tannic acid.

Hyperiodic acid is sparingly soluble in concentrated alcohol and ether; the dissolution is perceptibly easier with the former

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than with the latter of these liquids. It ultimately passes into the state of iodic acid, which is easily recognised by the precipitate which it produces with nitrate of silver, and the insolubility of this precipitate in nitric acid.

Hyperiodic acid is always produced either with hyperiodate of silver or of lead, both obtained with hyperiodote of soda.

Some useful remarks may be made on the preparation of the bibasic hyperiodate of soda.

Depending on the reaction which takes place between the bodies put in contact, it is recommended to take 1 equivalent of iodate of soda and 3 equivalents of hydrated oxide of sodium, and to subject them, after being dissolved in the smallest possible quantity of water, to a current of chlorine. It will be easily understood that if the reaction was quite complete there would be obtained, by thus operating, 1 equivalent of bibasic hyperiodate of soda IO^7, 2 SoO, 3HO, and 2 equivalents of chloride of sodium. This is not exactly the state of the case; there always remains in the solution which receives the chloruretted gas an excess of iodate of soda, about half the quantity employed. The best proportions are equal parts by weight of oxide of sodium and iodate of soda. By exactly following these directions we should always obtain a large quantity of hyperiodate of soda, especially if the precaution is taken first to dissolve the hydrate of soda, and then to add the iodate of soda to this solution, so as to have a very concentrated liquor, which is introduced, after being filtered, into a phial plunged into water kept just at the boiling point. In these conditions the reaction takes place rapidly, and each bubble of chlorine reaching the nearly boiling liquor is followed by a deposit of hyperiodate of soda.

With this salt are prepared, by double decomposition, the hyperiodates of silver and of lead, which themselves serve for obtaining hyperiodic acid. It is but sparingly soluble in water, but dissolves readily in it by the aid of a few drops of pure nitric acid, freed from nitrous acid. Nitrate of silver or of lead gives rise, in this solution, to an insoluble hyperiodate of one or other of these metals. The hyperiodate of silver thus obtained is represented, as correctly indicated by MM. Magnus and Ammermüller, by the formula —

$$IO^7, 2\,Ag\,O, 3\,HO.$$

It dissolves perfectly in nitric acid, and the solution, evaporated in the sand bath, deposits during the evaporation orange yellow crystals, no longer containing water, and only 1 equivalent of acid instead of 2. This last salt yields to cold distilled water, with which it is treated, pure hyperiodic acid, which may at first be concentrated at the heat of boiling water without suffering any alteration; but afterwards the concentration should be terminated in a vacuum, over a capsule containing sulphuric acid. Hyperiodic acid, thus prepared, furnishes crystals which never contain the least trace of iodic acid. It is not exactly the same when the method proposed by M. Bengiesser is followed, a method which consists in treating hyperiodate of lead with sulphuric acid diluted with water. The acid obtained, even when the operation has been conducted with care, and at a temperature not exceeding 212° F., is always mixed with a little iodic acid. We were careful also not to employ more than the exact proportion of sulphuric acid necessary to isolate the hyperiodic acid. We acted, in this respect, with the more security, as we knew, from our own analyses, the atomic composition of hyperiodate of lead. The formula is —

$$IO^7, 3\,Pb\,O, 2\,HO.$$

It is rapidly produced, and the reaction is complete by placing in contact 1 equivalent of bibasic hyperiodate of soda dissolved in water, and 3 equivalents of nitrate of lead. The hyperiodic acid is easily separated by subjecting it, while still hydrated, to the action of 3 equivalents of ordinary sulphuric acid. This acid always contains, when thus obtained, a little iodic acid, whereas, prepared with hyperiodate of silver, it is, as we have already said, perfectly pure.

The transformation mentioned by M. Rammelsberg of iodate of baryta into hyperiodate, by means of heat, furnishes likewise hyperiodic acid when this last salt is decomposed by sulphuric acid; but this process is accompanied by a considerable loss of iodine, which will always prevent it from being much used. We have, however, ascertained that hyperiodic acid is easily isolated from baryta by means of sulphuric acid.

Combination of Hyperiodic Acid with Soda.

We have already seen that chlorine, on reaching an almost boiling solution of iodate of soda and caustic soda, causes a precipitate of baric hyperiodate of soda.

We owe the discovery of this salt to MM. Magnus and Ammermüller, who made known its exact composition. It has some remarkable properties, which it would probably be interesting to confirm by new ex-

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periments. Thus it is only partly decomposed when heated to a red heat in a tube or glass retort. Its composition is the same as that of hyperiodic acid, only that 2 equivalents of water are replaced in this acid by 2 equivalents of base. Its formula is consequently found to be—

IO^7, 2 So O, 3 HO.

Brought to a temperature of 392° F., its state does not change—the water remains in combination. At a red heat, produced by a lamp with a double current, it loses weight in very uniform proportions.

	Gr.		Per ct.
I.	1·2200 of matter lost	0·3300, or	27·04
II.	0·4135 ,,	0·1125, or	27·20
III.	0·4650 ,,	0·1250, or	26·88
IV.	0·4180 ,,	0·1150, or	27·51

If we admit, as is the fact, that all the loss proceeds from the water and 6 equivalents of oxygen, we ought to obtain as a result, according to the composition of the salt, 27·55 per cent., a number which closely approximates to 27·16, representing the mean of all those furnished by experiment. These facts, already observed by the authors of the discovery of hyperiodic acid, lead us to assign a very remarkable composition to the residue. The following equation gives an account of the phenomenon—

IO^7, 2 SoO, HO=IO, 2 SoO+O^6+3 HO.

The properties of this residue tend rather to make us believe that it is composed of IO^3, 3 So O, + I So. It should, therefore, produce an iodite mixed with iodide, and corresponding by nature to the decoloring chlorites. Its formation may be explained in the following manner—

$(IO^7, 2\,SoO, 3\,H)^2 = IO^3, 3\,SoO, I\,So + O^{12} + 6\,HO$.

This iodite, left to the open air, absorbs water and carbonic acid, and is covered with iodine. It is difficultly soluble in water, but on contact with this liquid it soon becomes of a yellow color, and exhales an odor of saffron, greatly resembling that of iodine; each day, formed by the intervention of the carbonic acid gas of the atmosphere, the decomposition proceeds, and a larger proportion of iodine is set at liberty. In the air it behaves exactly like chlorite of lime.

It is also immediately decomposed by sulphuric, nitric, hydrochloric, sulphurous, acetic, and tartaric acids, and chlorine. This last reaction tends to prove that the iodite contains iodide; for it would be difficult to explain otherwise the reductive action of chlorine on an oxygenous acid of iodine. This iodite finally loses all its oxygen, when it is brought to a white-red heat in a platinum crucible.

Monobasic Hyperiodate of Soda.

According to MM. Magnus and Ammermüller, contains no water of crystallisation. Its formula should be—

IO^7, SoO.

Having been kept for several days over sulphuric acid in the vacuum of the pneumatic machine, and then analysed, we found in it 1 equivalent of base and 4 equivalents of water, which gives to it, as well as to the bibasic hyperiodate, a constitution similar to that of crystallised hyperiodic acid.

We obtained it by the ordinary process: that is to say, by saturating bibasic hyperiodate of soda with hyperiodic acid. Notwithstanding the employment of an excess of hyperiodate, the liquor always retains its acid reaction. This liquor, concentrated in a stove heated to from 122° to 140° F., furnished rhomboïdal crystals, sensibly reddening litmus.

The composition of the monobasic hyperiodate of soda being represented by IO, So O, 4 HO, it should lose by heat 14·40 per cent. of water. Experiment gave us, at the temperature of 284° F., 14·47. Finally, at the heat of the lamp with a double current, the loss of water and oxygen was 37·20, and theory gives 36·80. The residue is formed exclusively of neutral iodide of sodium.

Monobasic Hyperiodate of Potassa.

MM. Magnus and Ammermüller gave to this salt the name of *neutral hyperiodate of potassa*, doubtless because it only contains 1 equivalent of base, for it is not neutral; it strongly reddens litmus paper. Being formed by a pentahydric acid, it would be difficult to imagine that it should be otherwise.

We prepared it by directing a current of chlorine into a solution of iodate of potassa and of caustic potassa. By this means prismatic crystals are obtained, which are sparingly soluble in water, but still sufficiently so for the solution to have a sensible action on litmus. They do not contain any water of crystallisation. Their composition is represented by PO, IO^7. Being subjected to the action of heat, they ought to give—

Iodide of potassium	72·53
Oxygen	27·47

Experiment gave us—

Iodide of potassium	71·95
Oxygen	28·05

Hyperiodate of Lithia.

Hyperiodate of lithia, which had never been made before, is easily prepared by treating the carbonate of this base with

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hyperiodic acid. The solution being evaporated at a gentle heat, gives as product a crystalline mass, which entirely redissolves in water. The crystals, dried in vacuo, and brought to a red heat in a glass tube, successively disengage water, oxygen, and iodine. The decomposition, however, is not complete at this degree of heat; the residue still furnishes iodine on contact with sulphuric acid. There appears to be produced in this case, as we shall see further on with regard to the hyperiodates of baryta, strontia and lime, a quinquibasic hyperiodate, which only decomposes at the white-red heat.

Monobasic Hyperiodate of Oxide of Ammonium.

A solution of hyperiodic acid poured into liquid ammonia causes a precipitate, which forms instantaneously, and which is soluble in a large quantity of water. The resulting liquor produces, by a careful evaporation, very distinct crystals, the form of which appears to be that of the rhomboïdal prism. They redden litmus paper, and easily dissolve in water, with the addition of a few drops of nitric acid. Nitrate of silver produces in this solution an orange yellow precipitate, entirely soluble in nitric acid.

Heated in a glass tube, the crystals of hyperiodate of oxide of ammonium decompose with explosion. Their composition, according to our analysis, is as follows:—

$IO^7, NH^4O, 4\,HO.$

Theory indicates—

	Per Cent.
Iodine	52·58
Ammonia	6·94

Experiment gave—

Iodine	53·33
Ammonia	6·60

The Hyperiodates of Baryta.

Two of these hyperiodates were discovered and analysed by M. Rammelsberg. The first has for its formula—

$IO^7, 5BaO.$

Its composition corresponds to that of crystallised hyperiodic acid. The 5 equivalents of water are replaced in it by 5 equivalents of base. The second has also a very remarkable composition; oxide of barium is found as a substitute for only half the water contained in the acid—

$2\,IO^7, 5BaO, 5HO.$

We have obtained a third by treating by baryta water a solution of bibasic hyperiodate of soda in water charged with some drops of nitric acid. It was produced as a white precipitate, which we washed after collecting it on a filter. Before examining into its composition we dried it in a stove, and at a temperature never exceeding 212° F.

The quantity of baryta was determined by transforming it into sulphate by means of sulphuric acid.

I. 0·330 gr. of hyperiodate of baryta gave 0·208 of sulphate of baryta, or 63·03 per cent.

II. 0·354 of the same matter gave 0·219 of sulphate of baryta, or 63·45 per cent.

By assigning to this hyperiodate the formula—

$IO^7, 2BaO, 3HO,$

there should be 62·55 per cent. of sulphate of baryta, a number very nearly approaching that which we have just indicated. This composition is also confirmed by other results, producing this same salt when heated to redness in a glass retort or a platinum crucible. It disengages water, oxygen, and iodine, and the residue is a hyperiodate, with 5 equivalents of base, similar to that which M. Rammelsberg formed by subjecting iodate of baryta to a moderate heat. This reaction may be thus described—

$$(IO^7, 2BaO, 3HO)^2 = (IO^7, 5BaO)^2 + I^3 + O^{21} + 15HO.$$

A hundred parts should produce 62·30 of quinquibasic hyperiodate. In two successive operations we found 61·83 and 61·55. The quantity of sulphate of baryta produced in the residue, when treated by sulphuric acid, proves this composition. By operating in a crucible, and with the aid of heat, we obtained from 100 parts 103·88 of anhydrous sulphate of baryta in one experiment, and 103·28 in a second. Theory brings the quantity up to 103·04, which is quite in proportion with the number furnished by experiment.—*Annales de Chimie et de Physique*, March, 1852.

(To be concluded in our next.)

INTRODUCTION TO THE STUDY OF CHEMISTRY.

No. IX.

VI. Hydrogen *(continued)*

THE COMPOUNDS OF HYDROGEN WITH THE FOREGOING BODIES.

1. Hydrogen and Oxygen. Water. HO. 9.

Water was held to be an element until its compound nature was discovered by Lavoisier, in 1773, who first decomposed it into its constituents. In 1781, water was produced by the combustion of its elements by Cavendish and Watt, and Cavendish showed that the weight of the water pro-

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duced by this combustion corresponded with the weight of the two gases. Von Humboldt and Gay-Lussac showed that the volume of the oxygen was to that of the hydrogen exactly as 1 to 2. Dulong and Berzelius proved the relative weights of these two gases to be nearly as 88·9 : 11·1.

An accurate knowledge of the composition of water is of immense importance, as the extensive range of affinities exerted by oxygen and hydrogen, and the vast number of bodies into whose composition they enter, renders the equivalents of almost all other bodies dependent on those adopted for these two bodies. For the saving of space we shall pass over all other methods of determining the proportions in which hydrogen and oxygen combine to form water, and content ourselves with the following, that of Berzelius.

A bulb being blown in a glass tube, some oxide of copper is introduced into the bulb; one extremity of the tube, which is bent at right angles, is inserted in one neck of a two-necked bottle containing strong sulphuric acid, but not dipping into the acid; a flask containing the materials for generating pure hydrogen is connected with the two-necked bottle by means of a bent tube dipping into the sulphuric acid; the hydrogen generated passes through the acid, by which it is freed from water; heat is applied to the bulb containing the oxide of copper, and, at dull redness, decomposition begins; the oxide of copper becomes red hot, and water is formed and condenses in large quantity on the colder parts of the tube: when the reaction is finished, a porous mass of pure metallic copper remains in the bulb. The quantity of the water formed has now to be determined; for this purpose, a small bulbous tube, filled with pieces of fused chloride of calcium, is attached by means of a caoutchouc connector to the bulbous tube containing the oxide of copper, and the hydrogen is allowed to pass through the apparatus until the copper has become quite cold, and until all the water has been carried into the tube containing chloride of calcium, in which it is absorbed and retained. The tube containing the oxide of copper, having been weighed before the operation, is now again weighed, and the diminution of weight represents the amount of oxygen evolved from the oxide of copper; the tube, containing the fused chloride of calcium, which also had been weighed before the experiment, is also now again weighed, and the increase shows the weight of water generated, and hence the composition of water may readily be calculated, as follows:—

100 parts of black oxide of copper give
79·85 of metallic copper, and lose
20·15 of oxygen, which form
22·67 of water;
consequently,
22·67 of water consist of
20·15 of oxygen, and
2·52 of hydrogen;
or, in 100 parts,
88·9 of oxyen, and
11·1 of hydrogen.

To determine the combining proportions or atomic weights of these two bodies, it is necessary in the first place to examine the basis for deciding on the atomic constitution of water. It was formerly considered that equal volumes of all gases consisted of the same number of atoms: consequently, as water is formed by the union of 1 volume of oxygen and 2 of hydrogen, some chemists regarded it as consisting of 1 atom of oxygen and 2 atoms of hydrogen; if, therefore, taking oxygen as the standard of atomic weights, and calling its atomic weight 100, the result would be that 88·9 : 11·1 : : 100 : 12·50=the weight of 2 atoms of hydrogen; consequently, the atomic weight of 1 atom of hydrogen would be 6·25. But as the same volumes of all gases do not contain the same number of atoms, the basis on which this number is calculated is erroneous, and so, consequently, is the number itself: moreover hydrogen seldom combines with other bodies in the proportion of 6·25. Water also, in all the various combinations into which it enters, does so in a proportion which shows that it contains 12·50 and not 6·25 of hydrogen: again water enters into combination with a number of metallic oxides (forming hydrated oxides) in which there is the greatest reason to suppose that 1 atom of the metal is in chemical union with one of oxygen. The number 12·50 is based on its being equivalent to 100 of oxygen, that is to say, the proportion which combines with 100 of oxygen: for convenience, and in order that hydrogen may be taken as unity, it being the lightest ponderable substance known, these numbers are divided by 12·50, which gives respectively 1 and 8 as the atomic weights of hydyogen and oxygen, and these are the numbers commonly adopted in this country.

Water is therefore regarded as constituted of 1 equivalent of each of its constituents, and according as the oxygen or hydrogen standard is adopted, its equivalent is:

			Oxygen Standard.	Hydrogen Standard.
Oxygen	1 atom		100	8
Hydrogen ..	1 „		12·5	1
Water.....	1	=	112·5	9

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Water may be decomposed by many processes, but we shall confine ourselves to the following:

1. Introduce a given weight of water into a glass retort, placed in a retort holder; connect the beak of the retort with a porcelain tube containing a given weight of pure iron wire rolled up, passing through a small furnace, and terminating in a spiral pewter pipe immersed in water; the porcelain tube is heated to redness and the water in the retort is boiled, and its steam, coming into contact with the red hot iron wire, is partially decomposed: its oxygen combines with the iron, and its hydrogen escapes by the other end of the pewter worm, and may be collected in the usual manner. The portion of water which is not decomposed condenses in the worm and is received in a Woulfe's bottle connected by one of its necks with the nipple of the worm, the hydrogen passing into the vessel in which it is to be collected, which is connected with the Woulfe's bottle by the other neck. In this experiment, the iron will be found to have augmented in weight from the absorption of oxygen, and if the weight of the water undecomposed be ascertained and deducted from the weight of water placed in the retort, and the weight of the water decomposed thus determined, and if the weight of the hydrogen generated be estimated, it will be found that if the increase of weight of the iron (that is the weight of the oxygen absorbed by the iron) be added to that of the hydrogen collected, the sum will be equal to the weight of water decomposed.

2. The decomposition of water by voltaïc electricity best shows its composition, because its two constituents are isolated in the gaseous form. This decomposition may be simply effected in the following manner:—Two holes are bored in the bottom of a glass vessel, and into each a bundle of platinum wire is inserted, and a solution of sealing wax is run over the apertures to prevent leakage; water is put into this glass vessel; over each bundle of wire is placed a deep, narrow inverted graduated glass, also filled with water. The bundles of wire are now connected with the wires of a tolerably powerful voltaïc battery; oxygen is evolved in one of the inverted glasses over the bundle constituting the positive electrode, and hydrogen in the other, or negative electrode. It is thus found that one graduated tube contains one volume of oxygen, and the other two volumes of hydrogen. On mixing and detonating these gases, water is again formed. To effect this decomposition, the conducting power of the water must be increased by the addition of about 1 part of sulphuric acid to 10 of water.

Water is estimated to constitute about three-fourths of the globe. As it occurs in nature, as in springs and rivers, it is so largely impregnated with saline substances, and sometimes organic matter, as to be quite unfit for many chemical purposes. Rain water is less impure, but always contains small quantities of carbonic acid, atmospheric air, ammonia, and vegetable or animal matter. It is asserted by Hassenfratz that snow water contains an excess of oxygen. The terms *hard* and *soft* water refer to its less or greater degree of purity.

The purity of water for domestic purposes has of late years,—and especially since the terrible visitation of cholera in 1849,—occupied much of the public attention, and numerous chemists have analysed the water supplied by the various Water Companies in London, and that from sources from which it has been proposed that in future it should be obtained; but hitherto we believe that, although the present supply is all but universally coudemned, no authoritative decision has been come to as to the best source for a future supply. Water is of such vast importance, and its purity is of so much consequence, that we have been quite unable to desist from thus turning aside in our course of chemical instruction to animadvert on the conduct of the legislature in allowing year after year to pass away without coming to a practical decision on a question which seriously affects in some way every class of Her Majesty's subjects in London.

Water may be freed from fixed impurities by distillation. This is performed in the large way in a copper still, with a copper or pewter head, connected with a pewter worm surrounded by water, which must be kept very cold. The water in the still is boiled, and the steam condenses in passing through the worm. The fixed matters remain in the still. As this distilled water always contains slight traces of impurities, to obtain it perfectly pure it must be redistilled in silver vessels at a moderate temperature.

PURE WATER is perfectly transparent and devoid of color, taste and odor. It boils at 212° F., the barometer being at 30 inches, and congeals (forming ice) at 32° F. In consequence of the ease with which it is obtained perfectly pure, it is taken as a standard by which to compare the relative weights of all other fluid and solid bodies, its specific gravity being called 1·000. At 62° F., the temperature at which specific gravities are generally calculated, 1 cubic inch of water weighs 252·458 grains, and at 63° F. 252·5, and the cubic foot 998·217 ounces, which is so near to 1000, that the

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specific gravity of any substance, in comparison with water, is very nearly the absolute weight of a cubic foot of that substance in avoirdupoise onnces. Water is about 815 times heavier than atmospheric air. Water is also assumed as unity in the determination of the specific heat of bodies: the specific heat of water has been accurately determined by Regnault.

Canton has shown that water is susceptible of compression, and Perkins asserts that its bulk is diminished one-twelfth under a pressure of 2000 atmospheres. From Œrsted's experiments and those of Colladon and Sturm, its absolute diminution of bulk for each atmosphere is only 51 3-millionths of an inch. Dessaignes says that water, when subjected to very sudden compression, becomes luminous.

The specific gravity of ice, according to Berzelius, is 0·916. Ice is nearly if not a perfect non-conductor of electricity. According to Faraday, under favorable circumstances, it becomes electric by friction. Water, in being converted into ice, expands with so much force as to burst the strongest vessels in which it may be confined. Major Williams tried some very interesting experiments on this subject. He filled bomb-shells, 13 inches in diameter and 2 inches thick, with water, and stopped the fuse-holes with iron bolts: the shells thus charged were subjected in the open air to a temperature of between —4 and —19°. At the moment of freezing, the plugs were dislodged, and the ice made its way through the aperture. When the plug hole was fully secured, the shell itself was burst. Ice loses in weight by evaporation when exposed to the air.

The specific gravity of steam, at the common temperature and pressure, is found to be 624, atmospheric air being taken as unity. In the formation of steam at 212° F. and 30 inches of barometrical pressure, water expands to 1696 times its volume, according to Gay-Lussac. which gives almost exactly a cubic inch of water to a cubic foot of steam, which contains 1728 cubic inches.

Water combines with many substances, with various degrees of force: when it aids in the crystallisation of bodies, it is called *water of crystallisation.* Other compounds which water forms, as with the metallic oxides, are called hydrates. In each of these cases, the water entering into combination in definite atomic proportions, may be regarded as a constituent of the body in question. When water is only mechanically retained by bodies, it is called hygrometric water.

Water which has been left exposed to the access of atmospheric air, always contains some air, which may be demonstrated and separated by boiling, or by the action of the air pump.

The following table (from Professor Brande's *Manual of Chemistry*) shows the quantity of gases which water is capable of absorbing at mean temperature and pressure, the water having been previously freed from the air by long boiling *in vacuo* :—

Gases.	100 volumes of water absorb.	Authority.
Oxygen	3·7	Dalton.
Chlorine	200	Gay-Lussac.
Oxide of chlorine ..	300	Stadion.
Hydrogen	1·56	Henry.
Hydrochloric acid (average)	50000	Davy
Hydriodic acid		
Nitrogen	1·56	Henry.
Nitrous oxide.....	100	ditto.
Nitric oxide	5	
Nitrous acid		
Ammonia (average).	67000	
Sulphurous acid....	3000	Davy.
Sulphuretted hyrogen	100	Dalton.
Phosphuretted hydrogen	2·14	Henry.
Ditto	12	Davy.
Carbonic oxide (avge.)	2	
Carbonic acid.....	100	Dalton.
Carburetted hydrogen	12·5	Ditto.
Cyanogen.....	450	Gay-Lussac.
Fluoboric acid. ..	70000	John Davy.
Fluosilic acid	35000	Saussure.
Hydroselenic acid.	300	Berzelius.

Peroxide of Hydrogen.
HO^2. 17.

This body was discovered by the eminent French chemist, Thenard, in 1818. He produced it by dissolving the peroxide of barium in hydrochloric acid and water, and adding sulphuric acid, which precipitates the protoxide of barium in the form of insoluble sulphate of baryta, the excess of oxygen being transferred to the water. Water is by degrees saturated with oxygen by the repetition of this process several times. The entire process is beset with so many difficulties that it has very seldom been repeated, and we possess very little knowledge concerning this curious compound beyond what Thenard himself has communicated to us in his original memoirs. It has been thought that it is a solution of liquid oxygen. Thenard, however, regards it as a definite compound of 2 equivalents of oxygen and 1 of hydrogen.

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			Per cent.	Thenard	Vols.
Hydrogen ..	1	1	5·9	6·02	1
Oxygen	2	16	94·1	93·98	1
		17	100·0	100·00	

Much of the success depends on the purity of the peroxide of barium used for obtaining it. The peroxide of barium may be most easily prepared by mixing pure baryta with its own weight of chlorate of potassa, and heating the mixture nearly to redness; when oxygen begins to be disengaged from the chlorate, the mass becomes red hot at one point, and this spreads over the whole mass. The baryta burns, as it were, in the atmosphere of oxygen and peroxide of barium is produced. If the residue be now washed, the chloride of potassium resulting from the decomposition of the chloride of potassa is dissolved out, and the peroxide of barium combines with an equivalent of water, forming a bulky, white, insoluble hydrate, which remains behind, and may be collected on a filter.

Pelouze's method of forming peroxide of hydrogen is the best. Peroxide of barium is added to dilute hydrofluoric acid (fluoride of hydrogen) until the liquor is no longer acid: the fluorine combines with the barium, and the oxygen combines with the hydrogen.

Peroxide of hydrogen is a thick, colorless, inodorous fluid. Its specific gravity is 1·45. It blisters the tongue, and has a nauseous metallic taste. It destroys all vegetable colors. Its reactions are so energetic that, in order that they may be accurately observed, it is necessary to dliute it with many times its bulk of water. It may be kept for a considerable time at 32° F; it is decomposed at a temperature below 212° F. All the metals, with the exception of iron, tin, antimony and tellurium, decompose it: the metals should be employed in the state of powder or fine division: silver and its oxide, platinum and gold, instantly decompose it, heat and light being evolved; lead and mercury separate the oxygen slowly. Orpiment and sulphuret of molybdenum in fine powder produce the same violent effect as silver; the peroxides of manganese and lead instantly decompose it. Albumen and fibrine, which resemble each other in so many respects, differ in this, that fibrine rapidly decomposes peroxide of hydrogen, whereas, albumen has no action on it.

Peroxide of hydrogen, even when very dilute, decomposes spontaneously,; oxygen is evolved, and water remains behind. This decomposition is hastened by the presence of an alkali in the liquid, and retarded by that of an acid.

Suboxide of Hydrogen. H^2O. 10.

Paul condensed 1 volume of hydrogen into 3 of oxygen. De Marty asserts that water combines with hydrogen by degrees, absorbing nearly its own volume in two years. Gmelin has consequently inferred the existence of a suboxide. According to Kästner the suboxide is likewise formed by frequently saturating water with sulphuretted hydrogen, and removing the sulphur by means of metals which have a powerful affinity for it.

We shall conclude the subject of hydrogen in our next by treating of hydrochloric, hydriodic, hydrobrobumic and hydrofluoric acids.

ON THE ANALYTICAL PROCESSES TO BE FOLLOWED IN THE EXAMINATION OF EXPLOSIVE MIXTURES CONTAINING NITRATE AND CHLORATE OF POTASSA WITH ORGANIC MATTERS.

BY M. E. COTTEREAU.

The difficulties inherent to the analyses of mixtures containing nitrates and chlorates, which difficulties we have recently met with in the examination of a white powder, which, it was supposed, was intended to replace gunpowder, and which also contained ferrocyanide of potassium,—have induced me to publish the observations which I made on this subject, hoping that they may be useful, perhaps, in cases in which, for example, analogous mixtures might be compounded by taking as a basis the formula for fulminating powder published by M. Augendre, of Constantinople, which powder contains ferrocyanide of potassium, chlorate of potassa and sugar.

Suppose that we have to analyse a mixture of ferrocyanide of potassium, chlorate of potassa and nitrate of potassa, and let us see by what means we may determine, first the nature, and then the quantity of the ingredients of such a compound.

QUALITATIVE ANALYSIS.

To arrive at this determination, regard must be had to the following considerations:—

1. The test of M. Desbassins of Richemond, (protosulphate of iron), exerts no action on chlorate of potassa; consequently when a few fragments of chlorate of potassa are added to sulphuric acid at 66°, holding in suspension a few crystals of protosulphate of iron, and the mixture stirred, only a greenish yellow color appears, resulting

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from the decomposition of chlorate of potassa by sulphuric acid.

This coloration, which very soon disappears by agitation, by no means prevents us from appreciating the rose coloration which is simultaneously produced when, instead of operating with chlorate of potassa alone, we act with a mixture of this salt and nitrate of potassa.

The same test of M. Desbassins of Richemond does not give rise to any change of color with the ferrocyanide of potassium, *if the mixture be carefully effected without the intervention of the action of water;* consequently, when a few pieces of ferrocyanide of potassium are dropped into sulphuric acid at 66° holding in suspension crystals of protosulphate of iron, and the mixture stirred, no coloration is produced; but if we add to the mixture a few drops of water, an intense blue coloration is immediately produced, owing to the presence of Prussian blue, which is produced only by the intervention of water. It may very well be conceived that, if in the first case, the ferrocyanide of potassium does not prevent the rose coloration which is produced in the mass when a trace of nitrate of potassa is added, from being perceived, this reaction cannot be appreciated in the second case, on account of the presence of Prussian blue, which disguises the first coloration.

From the foregoing, it is evident that the test of M. Desbassins de Richemond may be of great use in the qualitative analysis of the mixture to be analysed.

Without recapitulating here the ordinary reactions of potassa and ferrocyanide of potassium, we will pass at once to the quantitative examination of a mixture, in which the presence of ferrocyanide of potassium, chlorate of potassa and nitrate of potassa was detected.

QUANTITATIVE ANALYSIS.

To arrive at the determination of the proportions of the constituent principles of such a mixture the following bases must be relied on.

When a mixture of ferrocyanide of potassium, chlorate of potassa, and nitrate of potassa is strongly calcined in the air, the chlorate of potassa is converted into chloride of potassium, whilst the nitrate of potassa passes to the state of nitrite or carbonate of potassa, according to the respective quantities of nitrate and organic matter contained in the mixture. As regards the ferrocyanide of potassium, it is decomposed in such a manner that its organic portion is converted into water, carbonic acid and nitrogen, whilst its inorganic elements remain in the residue of calcination, the iron in the state of peroxide, and the potassium in the state of carbonate of potassa.

When this is done, if we lixiviate the residue with boiling water, a liquid is obtained which may be separated from the insoluble oxide of iron by filtration: it is then easy to collect this oxide by dissolving it in an acid, precipitating it from its solution by means of ammonia, washing, calcining and weighing it. From its weight is deduced that of the ferrocyanide which existed in the mixture analysed. (100 grammes of anhydrous peroxide of iron represent 461 grammes of pure, anhydrous, ferrocyanide of potassium, or 528·50 of this salt crystallised with 3 equivalents of water.)

As regards the liquid arising from the lixiviation of the residue of the calcination, it is divided into two equal parts, which are subjected to the following operations.

1. In the first portion, which is acidulated by means of nitric acid, in order to decompose the carbonates, we estimate by means of a normal solution of nitrate of silver, for example, the quantity of chloride of potassium, and, consequently, the proportion of chlorate of potassa existing in the mixture analysed. (100 grammes of dry chloride of potassium represent 164·29 of chlorate of potassa.)

2. To the second portion of the liquor an excess of hydrochloric acid is added, which converts into chloride of potassium the nitrite and carbonate of potassa resulting from the decomposition of the nitrate of potassa and ferrocyanide of potassium. This chloride is added to that which results from the decomposition of the chlorate, and the quantity of which is known. The liquid is evaporated to dryness and strongly heated to drive off the excess of hydrochloric acid, and the residue redissolved in distilled water, and the chlorine existing in the liquid is again estimated by means of a normal solution of silver. We are thus enabled to arrrive at a quantity which represents all the chloride of potassium contained in the liquid.

From this quantity is deduced:—

1. The proportion of chloride of potassium arising from the chlorate of pottassa.

2. The proportion of chloride of potassium resulting from the conversion of the carbonate of potassa, produced by the decomposition of the ferrocyanide of potassium. (100 grammes of pure anhydrous ferrocyanide of potassium contain sufficient potassa to give 80·971 of dry chloride of potassium; or else, 100 grammes of ferrocyanide of potassium, crystallised with 3 equi-

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valents of water, contain sufficient potassium to give 70·630 milligrammes of dry chloride of potassium.

After having deducted these two proportions of chloride of potassium, which arise from a different origin, from the total quantities found in the second estimation of chlorine, the remainder represents the chloride of potassium formed at the expense of the potassa which originally existed in the state of nitrate in the mixture analysed. (100 grammes of dry chloride of potassium represent 135·55 of dry nitrate of potassa).

Moreover, if the the existence of another base than potassa be suspected, the latter may be estimated by the ordinary means.

One recommendation which must not be lost sight of in performing the analysis which we have just described, is to operate the calcination of the mixture by adding to it about 10 times its weight of pure sand, in order to prevent explosions, and that the combustion may be effected slowly and without projections, which would cause a loss of matter and thus falsify the results of the analysis.—*Journal de Chimie Médicale*, April, 1852.

ON THE CHEMICAL COMPOSITION OF FRAGMENTS OF COLORS COLLECTED FROM THE ARAB PAINTINGS OF THE FIFTEENTH CENTURY, OF THE ALHAMBRA, AT GRENADA.

BY MM. J. PERSOZ AND ED. COLLOMB.

THE internal ornaments of the principal halls of the palace of the Alhambra, the ancient residence of the Moorish kings at Grenada, are of plaster; the mouldings and designs, in relief, represent arabesque forms; the contour of the design never reproduces natural objects, such as flowers or animals, in imitation of the forms derived from the animal or vegetable kingdom, because this is forbidden by the Mahommedan religion; they are geometrical forms, which are repeated everywhere, but which have not much less elegance and delicacy.

Since the period of the construction of the Alhambra they have not undergone any serious damage; they are nearly as they were in the time of the Abencerrages; they are, moreover, protected by the beautiful climate of Andalusia; subsequently the Spanish government has annually devoted funds for the maintenance of the monument.

In some of the saloons and galleries which surround the celebrated "Court of Lions," we still see colors, applied formerly by the Arabs in the anfractures of the arabesque figures, remaining in all their integrity. They are very simple; they are composed only of red, blue, yellow and green, distributed with much taste: red and blue predominate.

With regard to the date* of the construction of the edifice, all that we know is, that the Moors were expelled from it at the commencement of the year 1492, an event which is commemorated on the principal tower of the Casbah, in the Alhambra, in a long inscription engraved on a marble slab, and which commences thus:—

"El dia 2 de enero, del anno de 1492 de la era cristiana, a los 777 de la dominacion arabe, declarada la victoria y hecha entrega de esta ciudad, a los SS. reyes catolicos, se colocaron en esta torre," &c., &c.*

These paintings are therefore anterior to the end of the fifteenth century.

In the course of last year, one of us, being on a geological excursion in Andalusia, had an opportunity of collecting some fragments of these colors: we have subjected them to chemical analysis.

The blue matter, detached in great part from the plaster adhering to it, and treated first with crystallisable acetic acid and alcohol, to remove from it the fatty or waxy substance which appeared to accompany it, acquired, by this preliminary treatment, great brilliancy of tone; it was then subjected to the action of caustic potassa, which did not cause it to undergo any alteration. Then, put in contact with concentrated hydrochloric acid, it was instantly completely decolored, and became white; a floculent and gelatinous deposit was formed, and, notwithstanding the smallness of the quantity of the substance on which we operated, sulphurous gas was perceptibly disengaged from the tube. Judging from these reactions, this color, therefore, is formed of ultramarine.

The green color, treated by the same reagents, was found to be composed of two elements, one blue, and the other yellow: the blue manifested all the properties of ultramarine, and it was, therefore, this substance which served as the basis of the green color. The yellow element, gently heated in a lamp on a sheet of platinum, was immediately destroyed, becoming at once black, and manifesting the reactions of an organic body, either a gum or a vegetable lake. The smallness of the quantity

* On the 2nd of January, in the year 1492 of the Christian era, and 777 of the Arab domination, victory was declared, and this city was entered, by their Catholic Majesties, they took up their residence in this tower, &c., &c.

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which we had at our disposal did not admit of our determining its nature more accurately.

The red color, previously dried and gently calcined, to free it from the small portion of organic matter which it might contain, passed from bright red to dull red; afterwards, being more powerfully calcined in a spirit lamp, and being covered with pure iron filings, an aureola was manifested in the midst of the tube, in which we recognised several small globules of mercury; on adding a drop of nitric acid, red vapors were disengaged; evaporated to dryness, the aureola was colored of an orange yellow; then, submitted to the action of sulphuretted hydrogen, it passed first to dark yellow, and then to blackish brown. These reactions clearly indicated that this red color is formed of vermillion, or sulphuret of mercury.

It results, therefore, from these experiments, that the blue and red employed by the Arabs of the fifteenth century in their paintings, were composed of ultramarine and vermillion.—*Comptes Rendus*, No. 14, April 5, 1852.

NOTE ON SOME PRODUCTS OBTAINED BY MEANS OF ESSENCE OF TURPENTINE.

BY M. J. CHAUTARD.

I HAVE already had the honor of addressing to the Academy a note relative to the action of hypochlorite of lime on essence of turpentine. (*See* THE CHEMIST, *New Series*, No. 29, p. 237). The product thus obtained is identical, in both properties and composition, with the chloroform derived from alcohol. Having heard that some persons are now occupied with studies concerning essence of turpentine, I request permission of the Academy to sum up, in a short note, the principal results to which my new researches have led me.

1. The reaction which I obtained with hypochlorite of lime and essence of turpentine occurs, with the same characters and always giving chloroform, when we treat, in an analogous manner, the essences of peppermint, juniper, copaiba, lavender, citron, thyme, rue, savine, badian, tarragon, and bergamotte.

2. A mixture of 100 parts of hydrochloric acid, 25 of binoxide of manganese, and 6 of essence of turpentine, distilled, and agitated from time to time, until the commencement of ebullition, gives acid water, and a yellow viscid liquid, denser than water, and of a slightly aromatic odor. No free chlorine is disengaged during the reaction; all these agents seem to enter into combination with the essence.

When we try to distil this product, in order to purify it, it is decomposed, producing phenomena very analogous to those presented in the distillation of the chloride of essence, $C^{20}H^{12}Cl^4$, obtained by M. Deville. The boiling point rises rapidly to 464° F.; then some vapors of hydrochloric acid are disengaged, and go on increasing in proportion as the thermometer rises. They were so abundant at 518° F., that I was compelled to stop the operation; there remained in the retort a black thick liquid, which solidified on cooling. The most remarkable thing in the distillation of this liquor is the appearance of various tints, yellow, green, blue, and indigo, and, finally, blackish brown, which it assumes during the different phases of the operation. The want of homogeneity of this substance has prevented me from submitting it to a rigorous analysis. Everything, however, warrants me in thinking that it is identical with the chloride of essence obtained directly by the action of free chlorine on essence of turpentine.

3. Hypobromite of lime, by its action on essence of turpentine, gave me a product perfectly parallel to that furnished by the hypochlorite.

Slaked lime was mixed with water, so as to form a perfectly homogeneous semifluid paste. Bromine was added by degrees, stirring incessantly, until the color of that body ceased to disappear. The mass became heated and thickened during the operation; sufficient water was then added to bring the whole to the primitive consistence. This done, essence of turpentine, equal in quantity to half the lime employed, was poured into the mixture, and the whole was briskly stirred, so as to form a perfect emulsion. The whole was introduced into a retort, and heated. A brisk reaction soon commenced, but much less tumultuous than with the chloride; carbonic acid was disengaged, and a heavy liquid, of an etherial odor, distilled over, on which floated a certain quantity of water. This crude product was rectified by several fractionned distillations, and a liquid was thus obtained all of whose properties presented the greatest analogy with those of ordinary bromoform.

4. Some experiments made on various other essential oils have given me results in conformity with the foregoing. This makes me think that bromoform as well as chloroform is a constant product of the action of the hypobromites and hypochlorites on all the essential oils. I will hereafter make

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known the numerical results obtained in the elementary analysis of these substances.—*Comptes Rendus*, No. 13, March 29, 1852.

PREPARATION OF DAHLIA PAPER.

DAHLIA paper may be prepared by taking the flowers of this vegetable, pounding them with a little water, pressing them, filtering the juice and spreading it over paper with a camel's hair brush.

Dahlia paper would at once replace blue litmus paper and reddened litmus paper. Indeed, put in contact, 1st with an acid liquor it takes a red color, 2nd with an alkaline liquor it takes a green color.

If the juice extracted from dahlias is not sufficiently concentrated, and does not color the paper sufficiently, it may be brought, by heat, to a suitable point of concentration; in this case, there is sometimes coagulation and a separation of flocks. The liquid must not be used without filtering.—*Journal de Chimie Médicale.* December, 1851.

II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

ON THE SULPHURATION OF CAOUTCHOUC, AND ON SOME PROPERTIES OF SULPHUR.

BY M. PAYEN.

THIS discovery, made in 1843, of the remarkable properties communicated to caoutchouc by means of a peculiar sulphuration, called *volcanisation*,* is generally attributed to Hancock, an English manufacturer.

From that period only the applications of this elastic substance have acquired real importance, and have given rise to several new branches of industry. From that time, indeed, the alterations previously produced on the proximate principle, either by elevation or abatement of the atmospheric temperature, had no influence on the volcanised product.

It retained its suppleness and its elasticity below 32°, and was not softened or adhesive at above 95° to 104° F.; its temperature might even be raised above 212° F. without its losing the tenacity useful for certain purposes, for, for instance, transmitting steam and mechanical force by means of flexible tubes.

The principal conditions of success in this manufacturing operation were carefully determined; in England, America, and France, several methods were successively devised which realised more or less perfectly the curious and important modifications of the sulphurised matter, but it was not known in what the chemical action consisted; there was no accurate idea concerning what was called the desulphuration; finally, certain alterations, especially the rigidity and fragility of several objects after sometimes a very short duration of the use for which they were destined, could not be comprehended, nor, consequently, prevented.

The researches which I have the honor of communicating to the Academy have for their object, and, I think, they will have the result, of clearing up those points of applied science.

I will first describe what occurs in one of the first processes of volcanisation, still employed by several manufacturers: it will afterwards be more easy to point out the effects of the other processes.

If a sheet of caoutchouc, two or three millimetres in thickness, be kept for two or three hours immersed in sulphur, liquified at the temperature of 201° to 208° F., the liquid will penetrate into the pores as water or alcohol would do, as we formerly demonstrated (*see* THE CHEMIST, March, 1852, page 241, for an interesting article on caoutchouc and gutta percha, by M. Payen), but still more quickly, and the weight of the sheet will be increased 10 or 15 per cent. Moreover, as had already been recognised, no considerable modification will have been made in the properties of the organic matter; it may be fashioned, and its recent sections joined the same as in the normal state. Solvents will attack it with the same energy.

However, it will be less porous. If, then, we raise in any medium whatever, inert of itself, the temperature to 275°, 302°, or 320° F., the conversion will be effected in a few minutes.

The mark would be overshot by prolonging the action of heat; the product would

* The etymology of this word comes from the word *volcano*, calling to mind one of the abundant sources of the sulphur used in industry, and for some years employed for modifying the properties of caoutchouc.

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become gradually less supple and less elastic, and would very soon be hard and brittle.

This last alteration would be more complete if the caoutchouc were maintained at the same temperature, (275° to 320° F.) in fused sulphur; the proportion of the latter body absorbed would gradually increase, until it became, in 24 hours, for example, almost equal to the weight of the organic matter, or would constitute 48 per cent. of the compound.

From the commencement of the action of the sulphur at this temperature, and during its continuance, a slight, but continuous disengagement of sulphuretted hydrogen occurs.* Liquid sulphur, at the temperature of 302° F., absorbs, and may retain, a volume of this gas almost equal to its own.

A curious phenomenon results from the foregoing fact. At the moment when the abatement of temperature allows the sulphur to crystallise, every crystalline particle liberates a bubble of gas; the latter is sometimes disengaged, and sometimes is interposed among the crystals: so that the entire mass gradually swells up, increases from 15 to 20 per cent. in its original bulk, instead of diminishing, as it should have done during a normal crystallisation of pure sulphur.

The results which I present in two comparative crystallisations render this phenomenon evident.

Instead of making the liquid sulphur penetrate at a temperature approaching its fusing point, caoutchouc may be mixed, by means of a mechanical grinding, with 12 or 20 times its weight of sulphur in fine powder; the properties of the organic substance are not changed; it may be modelled and joined as in the normal and unmixed state.

If the temperature be then raised to the degree at which the volcanisation is effected, it takes place, as in the first case; the suitable term would likewise be exceeded in the same circumstances, and the above-mentioned alterations would likewise be manifested.

COMPOSITION AND PROPERTIES OF CAOUTCHOUC VOLCANISED BY THE MEANS ABOVE INDICATED.

When the suitable term has not been exceeded, the organic matter contains sulphur in two different states: from 1 to 2 per cent. are retained in intimate combination,* and the surplus remains simply interposed in its pores.

The sulphur in excess, uncombined, is gradually eliminated from the caoutchouc by the mechanical action alternately exerted by the extension which closes the pores and contraction which opens them. This effect lasts for several months.

Many chemical agents more or less quickly and completely effect the elimination of the interposed sulphur, especially solutions of caustic potassa or soda, with the aid of heat (and even without heat, if renewed several times during a month), sulphuret of carbon, essence of turpentine, benzine, and anhydrous ether.

These liquids swell up the organic matter to such an extent that its volume is very soon increased eight or nine times.

Ether removes sulphur in a peculiar manner: a small proportion is first dissolved, and then carried out, when it is separated in crystalline particles; other particles successively dissolved in the interior follow the same course, and the crystals very soon become very bulky, affecting the octohedral form.—*Comptes Rendus*, No. 13, March 29, 1852.

(To be concluded in our next).

* At the same time an equivalent quantity of organic matter, containing more carbon than caoutchouc does, is separated, and may be extracted hot with a solution of caustic potassa or soda, which do not perceptibly attack the mass of caoutchouc combined with the sulphur.

* This combination has not altered the relations between the elements of the organic substance, which is represented by the formula C^8H^7, as I have proved by various analyses made with the aid of M. Poinsot, whether on normal caoutchouc, or on one of its two unequally soluble parts, or on compounds containing 0·015 to 0·485 of sulphur.

ON BIXINE, A NEW TINCTORIAL SUBSTANCE, PRODUCED IN GUIANA, INTENDED TO REPLACE ROCOU.

BY M. J. GIRARDIN, OF ROUEN.

IT is well known that the tinctorial pastes called rocou is the product of the seed of the tree commonly called aocouyer, which botanists have named *bixa orellana*. This tree grows spontaneously in the forests and high lands of Guiana. It is found in several countries of South America.

The seed of the *bixa*, enclosed in thorny capsules, is surrounded by an oily pulp of a bright red. This pulp, at the part fit for dyeing, is easily detached by steeping and washing the seed.

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This simple process is not that used by the planters in the manufacture of rocou. They crush the seed, either by passing it between cylinders, or by means of hand labor and a pestle. After the crushing, the seed is placed in vats to soak, then it is washed and pressed between the hands, and again subjected to crushing. These operations, which are repeated fifteen or twenty times, seem to divide the substance of the seed and the fibrous tissue to which it adheres into sufficiently small particles to pass through the sieve, by means of which the water from the various washings have been filtered. This water is left to repose until all the particles which were in suspension in the water are precipitated to the bottom of the vessel, and form a deposit, which, in the language of the country, is called *calé*. This calé is boiled, and then allowed to drain until it has acquired the required consistence. It is then formed into loaves or cakes, of from 6 to 7 kilogrammes, which are enveloped in the leaves of the cannacorus, and packed in wine casks. The casks generally contain thirty cakes, and the weight varies from 188 to 218 kilogrammes, including 4 per cent. of leaves.

It will be seen that this manufacture is defective, and the results produced bad. The slow manipulation causes the rocou to undergo putrid fermentation; and the coloring portion, diluted with a great volume of water, is found mixed with the other constituent parts of the seed and tissue—viz., fecula, mucilage, and woody fibre.

A cask of rocou, of the nett weight of 218 kilogrammes, contains—

	Kil.
Water	157·500
Leaves	8·400
Fecula, mucilage, woody fibre	39·900
Coloring matter	12·200
	218·000

Thus, when a manufacturer, a dyer, a color maker, buys a cask of rocou, for which, when the price of this paste is 1 fr. 20 c. the kilogramme, they give nearly 300 francs, they have, in reality, but 12·200 kilogrammes of coloring matter, and this matter costs them 24 fr. 6 c. the kilogramme, without counting the cost of freeing it from the foreign substances.

It is now a long time since endeavors were made to induce the planters of French Guiana to modify this bad process, by means of which they produce, after a long and expensive operation, a tainted, disgusting, and considerably decomposed mixture instead of a fine coloring substance.

Leblond, who, in the year XI. of the Republic, published a very interesting memoir on the culture of the rocouyer, and the fabrication of rocou,* proposed simply washing the seeds of the rocouyer until they are entirely deprived of the sticky and colored pulp which surrounds them, passing the washing water through fine sieves to separate all the remains of the seminal rind, precipitating the coloring matter, which remains a long time in suspension in the rind, by means of vinegar or lemon juice, and boiling it in the ordinary manner, or better to drain it in bags, as is done to indigo.

"In this manner," says Leblond, "rocou would be had always of the same quality, which would not contain this variable, but always considerable, quantity of foreign matter, which so materially augments the weight and diminishes the value of it."

Vauquelin prepared rocou in this manner by operating on seeds brought from Cayenne by Leblond. Two dyers in Paris, who tried this rocou, declared that it was worth four times as much as the commercial, without reckoning that it was much easier to use, that it required less solvent, that it caused less trouble in the coppers, and gave on silk a purer and not less solid color.†

Nearly half a century has elapsed since Leblond showed to the planters of French Guiana the errors of the method in use then, and still, for the preparation of rocou, thus showing the direction which should be followed to cultivate and bring to perfection an important branch of rural production in this colony. Unfortunately, his voice was not heard, and his memoir met with the fate of many other useful works which have been buried in the abyss of oblivion.

A Frenchman who had been established in Cayenne for twenty-two years, a M. du Montel, struck with the imperfection of the system of manufacture in use in the colony, endeavoured, without any knowledge of Leblond's former labors, to substitute a more rational method, and one which should have greater advantages both for the planter and manufacturer. His efforts were crowned with complete success. Replacing in the manipulation of the seed, washing for crushing and pressure, preventing the injurious action of fermentation by the employment of chemical agents and quickness in the operation, he obtained an extremely

* Vauquelin gave an extract from it in the *Annales de Chimie* of the 30th Thermidor, year XI., vol. xlvii., p. 113.

† Vauquelin, *Annales de Chimie*, 30th Thermidor, year XI.

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fine precipitate of an agreeable odor, and a very beautiful red color; it is the pure coloring matter of the rocou, without any mixture of foreign substances belonging to the interior of the seeds. It is this precipitate which he introduced into commerce, about a year ago, under the name of *bixine*.

M. du Montel operates in the following manner. His method of manufacture may be divided into four stages:—

1st stage. The seed is placed in vats full of water to soak; it is strongly agitated in the liquid with wooden stirrers; the continued quick motion causes the separation of the color. After immersion for twenty-four hours, the seed appears white: that is a sign that it is sufficiently washed, and retains no more coloring matter.

2nd stage. The colored water proceeding from the lixiviation is passed through very fine linen or calico sieves, and falls into a conical vessel, called a precipitation vessel. The straining is repeated twice, so that no foreign bodies may be introduced into it. This operation takes a day.

3rd stage. A chemical agent, which will not alter the color, diluted with a proper quantity of cold water, is poured into the precipitation vessel. Care must be taken whilst pouring in the chemical agent (the knowledge of which M. du Montel retains as a secret) to agitate the colored water strongly, so as to render the mixture as complete as possible. The precipitation takes place instantly. It is, however, advisable to wait eight or ten hours before decanting it. The decantation is quickly made by means of a tap placed at the level of the *calé*; but it is never complete: more or less water remains in the *calé*. To remove it completely, there is another tap at the bottom of the precipitation vessel, which allows the calé to run into a pipe, and this directs into a press, with edges covered with fine linen, and placed below the level of the precipitation vessel. This process produces, deducting the friction, a pressure of nearly 5,000 kilogrammes, a power more than sufficient to solidify in one day, by successive pressures, the calé proceeding from the lixiviation of 60 *bondes*, or 1,800 kilogrammes of seed.

The third stage requires about thirty-six hours.

4th stage. The precipitate being now of a sufficient degree of consistence to be divided into cakes, it is then cut, and the cakes are exposed to the air on dryers (planks joined, with holes in them, and covered with linen), when they remain until perfectly dry, care being taken to keep them always in the shade.

The dessication depends upon atmospheric circumstances; it requires only ten or twelve days if the weather is dry; it requires twenty or twenty-five days if the weather is damp.

They are then packed up.

M. du Montel's method of manufacturing, it will be perceived, preserves the coloring matter of the rocou from fermentation, and retains the sweet and agreeable odor of the flower of the rocouyer.

The exposure of the cakes to the air renders the surface brownish; but the interior remains of a beautiful color, of which the tint varies slightly, according to the nature of the earth in which the rocouyer has been grown.

We think with Leblond, Vanquelin, and M. du Montel, that as the coloring matter of the seeds of the rocouyer is entirely on their surface, and requires no special preliminary preparation for using in dyeing, it is quite superfluous to crush the seeds and cause them to ferment. Besides causing loss of time and money, these operations have the still more serious inconvenience of introducing a *very great quantity* of foreign matters into the rocou paste, which diminish its tinctorial power, augment the expense of transit, injure the beauty of the color, raise the price of the dye, and render the proportion of rocou very difficult to establish, as the paste of commerce continually varies in tinctorial power, simply from the different proportion of foreign matters proceeding from the crushed seeds.

I was last year employed by M. du Montel, who had sent two cases of his bixine to M. Adolphe Boivin, merchant at Rouen, to examine his product, and to give him my opinion on the tinctorial power compared with that of the rocou of commerce.

The following is a summary of my experiments on this tinctorial substance:—

1st. Bixine is in dry and brittle cakes, of a brownish red outside, and a bright orange red internally. It has not the disagreeable odor of the rocou of commerce.

2nd. It contains the coloring matter of the rocou in a much purer state than the paste of commerce. This coloring matter has undergone no alteration. It gives brighter and more lively tints to tissues.

3rd. It contains only 13 or 14 per cent. of water, whereas rocou in paste contains from 67 to 71 per cent. This continual variation in the humidity of rocou renders it more difficult to fix the proportion to be used in dyeing than in the case of bixine, which is always in the same state of dryness.

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4th. From bixine dried at 212° F. I obtained 40 per cent. of an orange red coloring principle, soluble in the alkalis and precipitated by the acids.

The best rocou has never given me more than 14 per cent. at the most.

Now, in estimating the comparative value of bixine and rocou, in the state of humidity in which they are ordinarily sold, it results from the preceding figures that bixine contains seven times and a third more coloring principle than good commercial rocou.

5th. In my experiments, on a small scale, to bring cotton to the tone given by 3 decigrammes of bixine, it was necessary to use the following quantities of rocou:—

	Gr.
Rocou in leaves.....	1·80
„ on paper.....	1·80
Rocou at 4·50 francs.....	2·90
Rocou at the same price, but from a different place....	2·90
Rocou at 3 50 francs.....	3· 0

Whence it follows that bixine had a tinctorial power six, nine and a half, or ten times greater than commercial rocou.

6th. In dyeing operations on a large scale, made by M. Leveillé, bixine, even that of the first quality, which had been sent to me from Cayenne in the course of the year 1851, did not present so great an advantage. The following is what occurred:—

Five kilogrammes of good rocou at 3 francs the kilogramme were boiled for two hours with 5 kilogrammes of a salt of soda and 260 quarts of water; they were then left to repose for twenty-four hours, and drawn off clear.

At the same time two baths were made in the same manner, but using, instead of rocou, one kilogramme of bixine of 1850 and of 1851 respectively. The bixine had been reduced to powder and sifted. The expense on the large scale of thus preparing 7 kilogrammes would be about 2·50 to 3 francs.

Thirteen quarts were taken from each bath, and diluted with 130 quarts, 8·900 kilogrammes of cotton were dyed in them, without heat, leaving it in the baths for twenty-five minutes, and turning each 7 times. After washing and wringing, it was dried in the shade.

The rocou gave a deeper tint than the bixine, and to bring the latter to the same tone, it was found necessary to add 4 quarts of decoction of bixine of the year 1851 to the first bath, and 10 quarts of decoction of bixine of 1850 to the other. Whence it follows that to equal 5 kilogrammes of rocou it will be necessary to use—

1·320 kilogrammes of bixine of 1851,
1·850 „ „ 1850.

Which shows that the bixine of 1851 has a coloring power $3\frac{2}{3}$ more considerable than rocou, whereas the bixine of 1850 is only $2\frac{2}{3}$ stronger. In fact, according to the results obtained..

The power of the racou which I used being expressed by	1· 0
That of the bixine of 1851 will be	3·78
That of the bixine of 1850	2·70

The selling price of bixine should be fixed according to these proportions.

The aurora and orange tints produced by bixine are much more lively and brilliant than those furnished by rocou.

I have observed that the bixine baths are exhausted by one dyeing, whereas the rocou baths will still give a pale aurora tint.

7th. Bixine being in the form of dry cakes, it is not so easy to introduce any fraudulent foreign matters into it as into the ordinary rocou sold in a soft paste. It is, moreover, known that the retailers of rocou have a bad habit of mixing urine into it from time to time, so as to keep it always moist, to augment its weight, and to heighten its color by means of the ammonia which the putrifaction of the urine soon developes in the mass impregnated with it.

8th. Bixine can be easily applied to painting, whether in water colors or oils, on wood, canvas, and on metals. The paste, which has been subjected to heat and putrid fermentation, and which is surcharged with foreign matters which can never, do what one will, be entirely separated from the color, is given a very secondary place, and cannot be used in painting.

It evidently results from what precedes that it would be very advantageous for the dyers in Europe if the planters of Guiana would adopt the process of M. du Montel for the extraction of the coloring matter from the seeds of the rocouyer, since this process, which is more prompt, convenient, and less expensive than the *modus operandi* hitherto employed, furnishes a pure tinctorial matter, giving more beautiful tints than the ordinary rocou.

The planters of Guiana would find it to their interest to imitate M. du Montel, for if they persist in sending for sale rocou of an inferior quality, they expose themselves to finding this product rejected, except at so low a price that it would not yield them any profit. Being available for purposes where rocou cannot be used, bixine will be sought for both in France and other countries; the consumption will increase, the current price of the market will become more fixed. The manufacture being simple,

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the packing and freight being inexpensive, it would ensure to the producers at the same time interest for their money and a fair and just recompense for their trouble.

Let us hope that, profiting by the advice of M. du Montel and by the teaching of science, the planters of Guiana, consulting their own real interests, will leave the track in which the influence of old custom has retained them for a century.

ADDITIONAL NOTE.

Since the preparation of this article on bixine I have analysed the samples sent me from Cayenne in the course of this year, and I obtained the following results :—

In 100 parts by weight of this bixine, I found—

Water	9·25
Red principle, soluble in alkalis, and precipitable by acids	44·40
Yellow principle, soluble in alkalis, and not precipitable by acids	3·01
Organic matter, soluble in alkalis	39·44
Mineral substances (carbonate and sulphate of lime, sulphate of potassa, silica, and oxide of iron	0·82
Alumina, a portion of which is foreign to bixine	3·08
	100·00

The bixine of 1851 gave me much less ashes than that of 1850. The following were the quantities obtained :—

Bixine of 1851 ..... 3·90 per cent. of ash.
„ 1850, No. 2 5·90 „ „
„ 1850, No. 1 6·40 „ „

All the ashes had the same composition, and in all alumina formed nearly three-fourths of the weight. The presence of so large a proportion of alumina in bixine may perhaps explain why, in the operations of dyeing, this colour does not go as far as might be expected, considering the state of purity of its coloring matter. The alumina forms, doubtless, with a portion of the latter, an insoluble lake, which does not combine with the fibres of the cotton.

This alumina probably proceeds from the use of alum to facilitate the precipitation of the bixine.

As I am about to receive some of the seeds of the rocouyer from Cayenne, I intend extracting the bixine without using any agent, and making the analysis of it in a state of absolute purity. I shall then complete this first notice on a substance which appears to me susceptible of application to very many useful purposes.—*Journal de Pharmacie et de Chimie*, March, 1852.

ON THE REFUSE ANIMAL CHARCOAL OF SUGAR REFINING: ITS NATURE, ITS MODE OF ACTION ON VEGETABLES, ITS EMPLOYMENT IN AGRICULTURE; AND ON THE ECONOMICAL ADVANTAGES WHICH SHOULD RESULT FROM THAT EMPLOYMENT.

BY M. A. DE ROMANET.

To appreciate the economical advantages which must result from the application of refuse animal charcoal to the first tilling of waste lands in the centre of France, an exact account must be given of the present result of grubbing up furze lands without the aid of animal refuse charcoal.

I will take as an example a farm, of which there are many in the central departments, composed of seven or eight hectares of natural meadows, which, in the memory of man, have not been manured, and bear a very small quantity of hay, more or less mixed with rushes, of 80 to 100 hectares of arable land, and of a nearly equal extent of furze or heath, which serve for the pasturage of cattle in general, but more particularly of wool beasts. It must at once be noticed that these furze lands are not sterile to the cultivator, as has been so often said; they produce wool, and beasts of the bovine, equine, and ovine races; they also produce manure for arable lands. And, indeed, by means of these heath or furze lands, the agriculturist occupying the farm maintains throughout the year a flock of ewes, which only sleep in the stable, and that without feeding (except during the heavy snows, five or six days in the year at most), and whose dung, added to that of his team beasts, enables him to manure his arable land.

I will suppose now that he grubs up, in a few years, one-third, or 30 hectares of his furze land; he will be compelled to reduce his flock one-third, for he will not have the resource of abandoning to pasturage, as a compensation, an equivalent extent of his old land, since, during a space of about the first three years the grubbed up furze lands do not give crops without the aid of animal charcoal. He will diminish by one-third the quantity of manure produced by his flock, and at the same time he will increase by one-third the extent of his arable land, which he will be obliged to manure in order

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to derive profit from it. He therefore rushes into inevitable ruin. If, instead of his furze lands, he could obtain artificial meadows, the result would be very different; he would replace the pasturage by feeding in the stable; he would have less expense for tending, and more manure: but this is not the case; in poor countries, containing no calcareous matter in which heath and furze lands are ordinarily met with, none of the plants which are cultivated for forming artificial meadows can succeed without marling. Now, marling is often impossible, on account of the distance at which marl is found, and marl is absolutely absent in these countries. He must, therefore, suffer the consequences of his imprudence in grubbing up. This it is which ruins the agriculturists who come from the eastern departments, bringing with them systems into a country whose advantages and dangers they do not know.

Let us now take a similar farm, and place on it an intelligent agriculturist who is acquainted with the resources which refuse animal charcoal presents. I will suppose that he will grub up at first 5 hectares of furze, and continue doing this so long as he finds it advantageous. He sows them immediately, and if he is wise enough not to seek to increase his grain crops very considerably during the first year, he leaves for pasture an equal superficies of old lands, so that he does not affect his flock. From that time he has a quantity of stable manure proportionate to the extent of his old land, which he leaves fallow. What will he do with this manure? It is here that I see the means of a certain and immediate amelioration of Sologne, and of all the provinces which possess much heath or furze lands. This manure, if he will put it on natural meadows, which bear only a small quantity of very mediocre hay, because they have never been manured, and which, from the time they have had a sufficient application of stable manure, will give him a quantity of good hay, amounting to double that previously obtained.

I may remark that I do not here give gratuitous suppositions, but that I am supported by facts which have long since occurred.

Brittany, indeed, is not content with that which is furnished by our manufactories; she procures refuse animal charcoal from Belgium, the Low Countries, England, the Hanseatic Towns, Austria, Denmark, Sweden, and especially from Russia; and the increase of these importations has been so rapid, that the quantities coming from abroad, which in 1837 amounted to scarcely 1,000,000 kilogrammes (about 1,000 tons), have now reached, on the average, in the single port of Nantes, 10,000,000 kilogrammes (about 10,000 tons) for each of the years of the decennial period from 1837 to 1847. By adding to these ten millions of kilogrammes, imported from abroad, the average quantity of 6,000,000 kilogrammes (about 6,000 tons) which Nantes has derived during the same period from French refineries, we arrive at a total of 16,000,000 kilogrammes (about 16,000 tons) entering annually into the single port of Nantes, which, at the rate of 95 kilogrammes per hectolitre, mean weight, gives for that town an annual total of 168,000 hectolitres, capable of fertilising 33,600 hectares of new land.—*Comptes Rendus*, No. 11, March 15, 1852.

ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.

Improvements in the extraction and preparation of coloring, tanning and saccharine matters from various vegetable substances, and in the apparatus to be employed therein. WILLIAM JEAN JULES VARILLAT, of Rouen, France, manufacturing chemist. Patent dated September 11, 1851.

The improvements claimed under this patent comprehend:

1. A peculiar arrangement of cutting machinery having one or two cylinders carrying cutting blades for chipping and shaving dyewoods.

2. An arrangement of apparatus for dissolving and separating the soluble portions of vegetable substances from the insoluble matters with which they are combined, by the use of hot water, at a temperature less than 100° Centigrade (212° Fahr.)

3. An arrangement of apparatus for evaporating in a vacuum, with double and triple effect, by means of the waste steam of an engine, or other steam expanded at less than 100°, working by the differential vacuum of one apparatus to the other, (the same being a new principle.)

4. An arrangement of apparatus for concentrating and solidifying the products of the preceding operations, having an agitator in the vacuum, with a heat less than 100°.

5. A system or mode of producing extracts, wherein, throughout the entire process, the heat is never raised so high as 100°, nor the materials under treatment exposed in any other way to a higher temperature. .

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Invention for preventing the injurious effects arising from the smoking of tobacco. GEORGE PHILLIPS, of Upper Park Street, Islington, chemist. Patent dated September 18, 1851.

It is well known that tobacco contains two highly poisonous constituents, nicotine and nicotianine, which are distilled over with the volatile oil during the act of smoking, and when introduced into the system tend much to the injury of the health and comfort of the smoker. The former of these products is volatilised at 320°, and the latter at 212° Fahrenheit. Now the object of the patentee is to intercept, cool down and condense these noxious oils: and this he effects by causing the smoke to traverse worms, or plates of metal, or surfaces of wool, cotton, or other suitable fibrous material, or discs of woven fabrics, or sawdust, pumice or other porous material, which will permit the passage of the smoke, but intercept and condense the volatile oils; and he prefers for this purpose, to use the material known as "wool in grease." He also saturates the fibrous or other material employed with fats or fixed oils, which he finds to act effectually in condensing the noxious products in tobacco smoking. The same effect may be produced by using alkaline solutions, but the patentee does not recommend their adoption, as they are found to destroy the true taste of the smoke. The fibrous materials, lightly packed, are placed in a stem of glass, in which they are retained by perforated corks, and they are introduced into the stem at about the middle of its length, so as to allow room for the mouth-piece and bowl to be attached.

The bowl is formed with a stem, which is introduced into the glass tube, and the space left between the interior of the tube and the stem of the bowl constitutes a reservoir, which serves to contain the condensed oils, &c., and prevents their return into the bowl; and sometimes the stem of the bowl has a cup attached to its end to prevent the oil passing into it. The mouth-piece is fitted in a similar manner,—that is, it has a stem which projects into the tube so as to prevent any condensed oil from passing into the mouth of the smoker. The improvements are also shown as adapted to meerschaums, and the tube may be fitted so as to admit of holding cigars. The patentee also in some cases introduces a wet sponge in the tube at the top, for the purpose of obtaining a water pipe.

Claims.—1. The use of any suitable material or substance applied to the various modes of cooling down the smoke, condensing the oils, and filtering them from the smoke. Also, the use of fixed oils and fats for the purpose described.

2. The construction and arrangement of the several parts of a pipe, as shown. Also, the mode of adapting the bowl of a pipe to the tube, so as to form a reservoir for the reception of the condensed oils, &c. Also, the mode of forming the reservoir at the bottom and top of the tube for meerschaums. And also the mode of applying a wet sponge at the top of the tube to form a water pipe.

Improvements in bending and annealing glass. FREDERICK HALE THOMTON, of Berners' Street, gentleman, and GEORGE FOORD, of Wardour Street, chemist. Patent dated September 25, 1851.

These improvements consist in combining means and apparatus for bending sheets of glass into concave forms, to be used for reflectors and other similar purposes, and for annealing the same.

The method which the patentees adopt in carrying their invention into effect is as follows:—They take concave moulds—by preference of cast iron, and as smooth as may be on the interior, and having a small aperture in the centre for the escape of air. These moulds are so constructed that they may be fitted in or on a vertical axis passing through the centre of the muffle or oven employed; which axis is so arranged as to be capable of being set in rotation, and of rising and falling for the purposes to be presently mentioned. The muffle which the patentee prefers is heated by two flues, one on each side exterior thereto, and the flames and heated products are caused to traverse the sides of the muffle through suitable flues, and to ascend and unite at about the top part of the muffle, so that the heat shall be greatest at the top. The moulding operation is performed as follows:—A mould is introduced into the interior of the muffle and supported on the axis; and when it has reached a dull red heat it is withdrawn from the muffle, and a plate of glass having been placed thereon, it is again introduced, and allowed to remain in the muffle, being gradually raised by lifting of the axis, so as to subject the glass to different and gradually-increasing degrees of heat, until it attains the bending point, which will be readily ascertained by the workman looking through an eye-hole. As soon as this is the case, the workman takes a convex piece of soft wood or cork, dipped in water, and having set the axis in rotation, he applies the same to the sheet of glass on the mould, and continues to keep it in contact therewith, using for this purpose slight pres-

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sure until the glass is brought to the concave shape of the mould. He then takes out the mould and concave sheet of glass from the muffle, and having covered the same with a piece of sheet metal, sets them aside to cool. The cooling in this manner will be found to partially anneal the glass, and the process of annealing is subsequently completed by heating several such concave pieces or forms of glass in a muffle, and allowing the same to cool, as is well understood.

Claim.—The combination of means and apparatus described for bending and annealing glass.

Improvements in ornamenting glass. WILLIAM HENRY RITCHIE, of Kennington, gentleman. (A communication.) Patent dated October 2, 1851.

The method usually adopted, when ornamenting glass with enamel, has been to spread the enamel over the face of the glass in a semi-fluid state, and, when dry, to remove or scrape off portions therefrom, according to the design or pattern to be produced. And sometimes lace or other open or reticulated fabric, has been employed to produce a pattern or design—the enamel in such case being applied to those portions of the glass which are left uncovered by the substantive parts of the lace or reticulated fabric used.

According to the method sought to be secured by the present patent, lace or other reticulated or perforated fabric is also employed, but in a different manner from what it has been heretofore. In this process, then, the glass is first covered, as in the ordinary method, with semi-fluid enamel, white or colored, which is allowed to dry, and when dry, a piece of lace stretched in a frame, is placed in contact with the enamel-covered surface, and kept pressed down by weights, and, with a soft brush, those parts of the surface which are left uncovered by the openings or perforations in the lace or other reticulate material, have the enamel removed from them, after which the lace is raised from contact with the glass, and the glass is submitted to heat, so as to fuse and fix the enamel, and subsequently annealed in the manner ordinarily practised. The same method of procedure will also be followed when perforated paper or other material than lace is used for producing in enamel ornamental patterns on glass.

Claim.—The mode described of ornamenting glass, whereby lace or other perforated or reticulated fabrics or materials are used when removing parts of the enamel or ornamenting material from the glass.

Improvements in the manufacture of glass, china, porcelain, earthenware and artificial stone. WILLIAM HODGE, of St. Austell, Cornwall. Patent dated October 2, 1851.

Mr. Hodge's improvements consist in the employment in the above-stated manufactures of the material known as hornstone porphry, otherwise called elvan or freestone, which has never hitherto been used for the purpose.

For the manufacture of glass, the elvan is to be reduced to powder and to be mixed with the other pulverised materials in the melting-pot; and as the constituents of elvan are silex in combination with potassa and alum in different proportions, it will be found a material well adapted for glass making. The proportions of elvan employed will vary according to the quality of glass to be produced, and the nature of the material will determine the quantity of fluor spar, lead, potassa or other flux for fusing the same. Thus, when the proportion of silex is large, an increased quantity of fluor spar will be required, and so with other fluxes. The elvan does not generally for this use require to be washed after being pulverised, but it may sometimes be found necessary to submit it to this operation.

For the manufacture of china, porcelain, and earthenware, the elvan is reduced to powder, and brought to a plastic state, when it is moulded in the usual way, and then dried and fired as customary. The elvan may be used alone, or may be combined with china clay, or such other materials as are commonly used in earthenware or china manufacturing; and according to the quantity in which it is used, so will the character of the manufactured article more or less resemble that of stone-ware. The elvan may also be used for making glazes in the same manner as other materials are now employed for the same purpose.

For producing artificial stone, the elvan may be used alone or in combination with granite or other similar stone or substance in broken fragments, or reduced to a powdery condition. The materials having been mixed together, are brought to a plastic condition, moulded into blocks, dried and fired in the usual way.

Although in the manufacture of articles of china, porcelain, and earthenware, the elvan is above directed to be powdered and brought to a plastic condition, and moulded into the form of article to be produced, it is nevertheless capable of being worked in a pulverised or disintegrated condition, and applied to the manufacture of articles by dies and pressure, the method of doing which is well understood.

Claim.—The application of hornstone porphyry, otherwise called elvan or free-

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stone, in the manufacture of glass, china, porcelain, earthenware, and artificial stone.

Improvements in obtaining motive power. JAMES FREDERICK LACKERSTEIN, of Kensington Square, gentleman. Patent dated October 9, 1851.

These improvements consist of combinations of means and apparatus for obtaining power by the use of carbonic acid gas.

The apparatus employed for generating the gas, and bringing it to a fit condition for use in the engine, consists of three vessels—a generator, a purifier, and an expander. These vessels are each of a cylindrical form, with hemispherical ends, and are connected with each other by suitable arrangements of pumps and pipes. The materials from which the gas is obtained (and which the patentee prefers to be sulphuric acid and carbonate of soda, in solution, or other equivalent materials yielding residuary products of commercial value) are pumped in atomic proportions into the generator, and caused to combine intimately by traversing a percolator filled with broken glass or other such materials, whereby an extended surface is obtained. After passing through the percolator, the used materials are collected at the bottom of the vessel, and discharged from time to time by means of a self-acting float valve, which rises from its seat when the liquid has attained a certain level, and falls again and closes the exit orifice when, by the discharge of part of the liquid, the level of the liquid in the generator is reduced. In order to prevent the float being crushed by the pressure of the gas, it is perforated at the top, whereby gas is admitted, and the interior filled at the same pressure, as exists in the generator. The falling liquid from the percolator is prevented from entering the float by a shield, which serves to disperse it, and keeps it from contact with the open part of the float. The gas produced in the generator is pumped into the purifier, where it is passed through water, and from which is supplied to the expander by a double plunger pump of a peculiar construction. The expander is surrounded by a jacket in which steam, hot air, or hot water is caused to circulate, and the pressure of the gas is thereby much increased, or the use of a current of electricity may be adopted for the same purpose. From the expander the gas passes to the cylinder of the engine, where it actuates a piston in precisely the same manner as steam is caused to act on the piston of a steam engine. After performing its duty in the cylinder, the carbonic acid is passed through a vessel, containing in solution some chemical substance, capable of combining with it to form a material, which on being concentrated or evaporated to dryness, may be again used in the production of carbonic acid gas. Those portions of the apparatus which are liable to be corroded by the acid employed, are to be protected by a covering of gold or platina, or to be formed of those metals. With the same view, the interior of the generator is lined with sheet lead.

Although sulphuric acid and carbonate of soda are the substances which the patentee prefers to use for producing gas for the purposes of his invention, he does not confine himself thereto, but uses bi-carbonates and sesqui-carbonates of soda, and carbonates of other alkalis, and other acids than sulphuric, as also substances with an acid reaction; the object which he has in view being to obtain at the same with the production of gas residuary materials of commercial value. Thus from sulphuric acid, and carbonates of soda, potash, or ammonia, are obtained residual sulphates of those bases; from nitric acid with the same bases valuable nitrates; from boracic acid and soda, the borax of commerce; from alum, with potash or soda, valuable fertilising salts; from chromic acid and potash, chromate of potash, a compound valuable in dyeing; and from hydrochloric acid and ammonia, sal-ammoniac of commerce. These however are merely given as examples.

Claims.—1. The employment of the specified materials when corrosive acids are used, in the construction of the pumps and other parts of the apparatus.

2. The use of a percolator whereby the materials forming the gas, are more intimately mixed together by passing through a more extended surface.

3. The self-acting float-valve, whereby the residuary matters collected at the bottom of the generator are discharged from time to time.

4. The purifier, whereby the carbonic acid gas is purified before being used, to prevent any injurious effect on the engine.

5. The pumping the gas into the expander to increase its pressure by the action of heat previous to its being used in the engine, whereby greater economy is obtained in the consumption of the gas.

6. The heating and expanding of the gas for the last-mentioned purpose by means of electricity.

7. The construction of a double plunger pump, which requiring no valve is particularly adapted for all aëriform and gaseous fluids, which require to be compressed or condensed under strong pressure, the mechanical arrangements of which are above described.

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PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

SANITARY NOTES.

THE following announcement has recently appeared in the public papers :—

"By advices received from Erzeroum, it appears that cholera has again broken out with severity in Persia, where the pestilence commenced before its recent visit to this country and the rest of Europe. It has appeared at Soouk Boolek, near Suleimanieh; and it is also reported that typhus was raging at Teheran as well as Tabreez. The local government, in a state of alarm, are taking measures to cleanse the city, in the hope of preventing it from visiting Erzeroum. There can be no assurance that it will not spread and take its former course."

The pestilence has recommenced its awful course from its original starting place; and how shall we be prepared for it? It is a serious question, and one that should be considered now, and not when it is at our doors in perhaps five years, or perhaps only two years hence. The last dread warning has had but slight permanent effect. What has been done since 1849 for the sanitary improvement of this huge abode of nearly two and a half millions of persons? The answer may almost be—*Vox et præterea nihil.* Words, words! The newly dead still fester amongst the living, because Mammon is more omnipotent than health. Tons upon tons of foulest refuse still send their rank poison up into the life-air, spread through the dwellings of millions of human beings, because incompetence reigns amongst Sewers Commissions. There is not a more disgraceful nuisance in London than that body to whom are professedly entrusted the duties of regulating and providing for the removal of the filth necessarily occasioned by a large aggregation of human beings. One special duty assigned to the present Commission was to prepare plans for the entire and comprehensive drainage of the town. Plans have been prepared, adopted, and afterwards abandoned; and these plans cannot be revived: they are useless, being ill-arranged and insufficient for the desired object. The rates that are levied are nearly all illegal. The act under which the Commission exists does not give authority to raise money. At present the powers of the Board are wielded by a lawyer, who makes an iron hand be felt on all his subordinates, so that a surveyor cannot—nay, dare not—*recommend* any work in his own department until the fiat of the man of law is obtained. Is the life and death of this great city to be left in such hands until the ravages of a pestilence again brings mourning into every house in the land?

At present a Committee of the House of Commons is again sitting upon the question of water supply to the metropolis. In this matter some improvement has taken place. The Lambeth Company no longer distribute *sewage*, but water brought from above Kingston. Still the fight is a severe one between the old monopolists and the consumers of an article necessary to life. A partisan of the old companies recently said: "If the Government succeed in Committee in forcing upon us the prices they propose, the old companies will probably close their works." Let the Londoners meditate on that threat, and consider whether the power of supplying them with *water* should be left in such hands.

Englishmen, you have but to will, to obtain Parliamentary Reform, relief from taxation, and a host of political evils; let that mighty *will* be heard demanding relief from Death and Disease, and you need not fear the re-approach of cholera.

ALBUMEN AND ARSENIC.

To the Editors of "THE CHEMIST."

GENTLEMEN,

SOME letters have lately appeared in the Journals from Dr. Sheridan, Mr. Muspratt, of Liverpool, and Mr. T. J.

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Herapath, of Bristol, on this subject, impugning the the accuracy of the statements and experiments of Mr. Edwards, described n the "*Transactions of the Chemical Society,*" and characterising them as absurd, &c. These gentlemen have, in my opinion, drawn a *hasty* conclusion. I should observe, also, that their own experiments have not been properly instituted, if they wished to establish the efficacy of albumen as an antidote to arsenic: the making of experiments in the laboratory by *boiling* the materials is not, I contend, sufficient proof, inasmuch as they will not apply to the poison in the human stomach.

The following experiments, which seem to me the more rational, will shew exactly how the matter stands.

1st Experiment. I took 3 grs. of arsenious acid, dissolved in sufficient quantity of water, and put it into a phial with 1 fluid oz. of albumen, shook them *incessantly* for 15 minutes—diluted with more water and filtered, and on adding a drop or two of hydrosulphate of ammonia, and then a little muriatic acid, an *abundant yellow precipitate of sesquisulphuret of arsenic* was produced.

2nd Experiment. I repeated the above but allowed it to stand for *two hours*, shaking at intervals; on testing again arsenic was found in abundance. This precipitate, be it observed, could not possibly be mistaken for sulphur, *as albumen and water only*, similarly treated, produced *no* such change.

These experiments speak for themselves. It must therefore be admitted that *no reliance* whatever can be placed on the use of albumen as an antidote, any more than on hydrated peroxide of iron; since, if it combines with arsenic, as Baron Liebig has stated, to form an insoluble coagulate, it ought to do so immediately, *or, at least, within a reasonable time*, else it is worthless; neither is the coagulate that is really formed wholly insoluble, as, on boiling, I have detected arsenic in the *filtered liquor*.

Hydrated peroxide of iron will, I know, if shaken up in sufficient quantity with a *clear* solution of arsenic, immediately and entirely abstract that body; but if, on the other hand, we mix the arsenic, *undissolved*, with peroxide of iron and water, *it fails*, whether it remain in contact with it for an hour, a day, or longer. In cases of criminal poisoning arsenic is seldom administered in such a soluble state as it can be made by the chemist; hence the difficulty to contend with, and the little reliance there is to be placed on any antidote however good in other respects.

Dr. S. Muspratt states that the coagulate compound is *not poisonous*, a statement which the concluding experiment of Mr. Herapath totally refutes, as the administration of a portion thereof to a cat terminated *fatally*. What more convincing proof than this of its inefficiency as an antidote!

I am, Gentlemen, yours respectfully,
JOHN HORSLEY.

The Laboratory, Cheltenham,
March 20th, 1852.

CASE OF POISONING BY LAUDANUM IN INFANCY, SUCCESSFULLY TREATED BY KEEPING UP ARTIFICIAL RESPIRATION BY MEANS OF THE GALVANIC BATTERY.

BY WILLIAM BIRD HERAPATH. M.D.

MRS. B—— was confined by me on Jan. 26, 1852, with the subject of the present case; therefore the age is correctly stated at thirty-nine days.

March 5, 1852.—This infant having a slight cough, his mother administered to him a small teaspoonful of what she considered at the time to be a cough medicine; but almost immediately afterwards she discovered that the bottle contained laudanum, and that she had therefore committed a serious error. This occurred shortly before 1 p.m. A very small portion of the laudanum was spilt, the child swallowing the remainder. When I saw it, at 5 p.m., the infant was almost *in articulo mortis*, cold pulseless, and the skin of the face and extremities blue; dyspnœa excessive; respiration taking place only by irregular, convulsive catches; pupils contracted to a mere point; the eyes rotated upwards under the brows; the child lay still and motionless, and, but for the occasional respiratory gasp, to all appearance dead.

As all the laudanum had been retained, and four hours had elapsed since its administration, I did not, from the appearance of the little patient, anticipate anything but a speedy death; but in order that the best chance might be given to it, strong mustard cataplasms were immediately applied along the spine, and an infusion of coffee administered, containing a little compound spirit of ammonia. This could only be given by a teaspoonful at a time; and even then it was swallowed with considerable difficulty. Whilst these remedies were being prepared the nurse was directed to keep the child in constant agitation, and to rouse it as much as possible. After a time some little evidence of returning animation appeared: it

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occasionally moved a limb, and attempted to open its eyes; the respiration was a little less embarrassed, and he became more able to swallow the coffee. This was steadily given until between one and two ounces were administered. The mustard plaster by this time began to take effect, and so much counter-irritation was produced, that I decided upon its removal for a time, lest vesication should be produced, which would wholly prevent the application of another. The child had now become somewhat uneasy, and its respirations were performed with more facility and regularity in consequence; but of course little consciousness showed itself. At 6 p.m. the case was relapsing again into its former condition. Another sinapism was applied to the chest and abdomen. Of course the child was not allowed to remain still during a single moment.

As it was clear that all the poison must have already passed into the circulation, it was useless to give an emetic: if administered, it would have probably failed; and if it had succeeded, it would only have caused the ejection of the antidotes—viz., the coffee and ammonia: and as it was evident that the treatment of the case would last many hours, if successful, but would fail if at all slackened for an instant, I determined upon bringing electricity to our aid. Whilst arranging the battery, my pupils were directed to administer electric shocks from a small Leyden jar, along the neck to the diaphragm; but the child did not appear to respond to this stimulus in the slightest degree. Having now got Horne, Thornthwaite, and Wood's little maintaining and multiplying battery ready, I began, at half-past 6 p.m., to pass a constant stream of electricity through the little patient.

After numerous trials, it was found that, by placing the zinc or positive wire on the mucous membrane of the mouth, and the negative or copper wire just below the ensiform process, the respiratory movements were carried on with considerably more regularity and ease than by any other method. It was evident that the stream of electricity, entering by the fifth nerve, was conducted by it to that portion of the spinal marrow (the medulla oblongata) which presides over the function of respiration, and which, being stimulated to action, its influence was sent through the phrenic and external respiratory and spinal nerves to the diaphragm, the intercostal and other accessory muscles of the respiratory process.

The fifth nerve is known to be a natural afferent or excitor nerve of the respiratory movements. We only, therefore, called its physiological action into play, and it cheerfully obeyed the call. Respiration succeeded steadily and regularly as long as the stream continued to be applied in this manner; but if the zinc or positive wire slipped from the cheek to the tongue, the movements became more gasping and convulsive; spasm of the glottis appeared to ensue, and if it had been persevered in, possibly asphyxia would have resulted; as another nervous arc was probably then employed, the gustatory branch of the fifth appearing to act as an excitor (through the medulla obloganta) of the superior laryngeal, thus closing the glottis, and probably inducing an act of deglutition at the same time.

The stream of electricity was maintained, with only an occasional intermission, during several hours. As long as the battery kept in action, all went well; the child breathed steadily, regularly, and almost as if nothing were the matter. At times the stream would get weaker, in consequence of more acid being required, or from the vibrating spring for making and breaking the contact getting out of order; at these times the little patient would experience a serious relapse. At 11 p.m. it had a very narrow escape; the only sign of life left was derived from auscultation; the heart was still found to beat, "tap, tap," about thirty times in a minute, faintly and just audibly. The battery at this nick of time was restored to action, and the aspect of the case again improved. From this period until 2 a.m. it was constantly maintained in action. At this period the electricity was slightly discontinued, as consciousness began to manifest itself; the little resuscitated patient appeared restless, uneasy, and in pain from the repeated sinapisms; it even attempted a feeble cry. In about ten minutes there were symptoms threatening relapse. The battery was again used for a few minutes, and a stimulating enema of one drachm of spirits of turpentine, six drachms of castor oil, in about four ounces of strong infusion of coffee, was used, whilst some coffee, with a little brandy, was administered by the mouth. This was swallowed with difficulty; some of it got into the larynx, and produced a fit of dyspnœa, but there was not sufficient nervous energy to produce a cough. Half-past 3 a.m.—He was so much recovered that he no longer required the stimulus of the battery; he had continued to breathe with tolerable ease during the last half-hour without its assistance. I left it at 4 a.m. in charge of my pupil, Mr. Phelps, who watched it carefully until I came down, at

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8 a.m. During the whole of this time the battery had been employed three times for short periods only; the last application was at 7 a.m. during ten minutes. I found it breathing naturally and with tolerable regularity; it would occasionally seem to catch in its breathing, as if a slight spasm of the glottis occurred; but by blowing in its face or shaking it, the inspiratory act would be induced, and all would again go on smoothly for some time, when a repetition of the spasm would call for similar treatment.

At 1 p.m., March 6th, it was sufficiently recovered to be left in the charge of its anxious parents, and to be removed from my house, where it had been all night. It was, however, still highly comatose, with the respiration occasionally stertorous. The bowels had not acted; some little of the enema had returned at the time of its administration, otherwise the greater part had been retained. At 4 p.m. I visited it: all was going on well; the child appeared to be slowly rallying from its stupor; it could not yet take the breast, but it swallowed small quantities of milk-and-water given by the spoon with more ease; respiration was going on better; the spasms continued to recur, though at longer intervals, and to become slighter in their intensity. The skin began to assume a more natural, healthy tint; it had lost the deadly, sallow hue it formerly had. The temperature of the surface was more natural; there was not that necessity for artificial heat which existed previously; it could now dispense with the fire and the blanket, and was lying in its cot; the sleep was deep, but the breathing had lost its stertor. Eight p.m.—The little patient continued to do well, but had not yet been able to take the breast; I advised them to watch it well during the night; in fact, to remain up with it.

7th.—One p.m.—Everything progressing very favorably; the child had awakened from its lethargy; it had taken the breast and cried lustily during the night. All danger therefore appeared gone. A dose of castor oil was ordered, and I prescribed a slight antimonial mixture for the cough, which appeared to trouble it.

8th.—Improving in all respects; ceased attendance.

(To be concluded in our next).

REPORT ON A MEMOIR OF M. BARRESWIL RELATIVE TO THE THERAPEUTICAL PROPERTIES OF TANNATE OF QUININE.

BY A COMMITTEE COMPOSED OF MM. ORFILA, BUSSY AND BOUVIER. (REPORTER.)

THE Academy of Medicine has instructed us to experiment on the tannate of quinine presented by M. Barreswil as a substitute for cinchona and sulphate of quinine.

This compound, which is a salt of quinine known to chemists, resembles, according to the author, sulphate of quinine in the fixity of its composition, and cinchona in the nature of its composition. This opinion, as M. Barreswil states, had been already expressed by Berzelius in his Treatise.

The tannate of quinine presented by M. Barreswil to the Academy is an amorphous powder, of a rather yellowish white, sparingly soluble in water, and, consequently, only very slightly bitter.

Its preparation is very simple; to obtain it, it is sufficient to pour a solution of tannin into a solution of acetate of quinine, to collect, wash and dry the precipitate, which is the tannate of quinine. M. Barreswil employs the tannin prepared according to the method indicated by M. Pelouze, and to obtain the acetate of quinine, he uses the pure or previously purified sulphate of quinine of commerce.

The analysis of the tannate may be made like that of the other salts of quinine, by the combined action of an alkali and a solvent; ether or chloroform.

The tannate, like the sulphate, may be kept without alteration; it does not attract moisture and is not colored by light; only as it is amorphous, it is to be feared that it will be more susceptible of adulteration than the sulphate.

It is administered, like all amorphous powders, in the state of pastilles, pills, or simply suspended in syrup, enveloped in the pulp of a fruit, in a wafer, or, better still, mixed with sugar and coffee, as is done with cinchona and sulphate of quinine. In the experiments submitted to the judgment of the Academy, by the author and by your committee, either mode of administration has been indifferently employed.

Experiment has shown that patients, even children, for whom tannate of quinine is prescribed, take it without repugnance, and it has been proved that this salt exerts on the stomach and on the intestines a very benign action, that it does not produce diarrhœa, nor any derangement in the system. M. Lambron does not hesitate in this to place tannate of quinine before

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sulphate of quinine, whose action, without being more certain is much less mild.

The tannate of quinine was experimented with comparatively with sulphate: the quantities employed in every case were those which would have been prescribed had sulphate of quinine been used. Generally to cut down a tertian or quartan fever requires at most 3 grammes; for a quotidian fever 2 grammes given in doses of 25 centigrammes to 1 gramme. As a tonic the quantity prescribed was 20 centigrammes per day. In certain cases, the fever yielded to the first dose; in others, it entirely ceased only after a number of fits, varying from two to six, and which amounted on the average to three.

The medicament was generally administered in quotidian fevers after the fit; in tertian fevers on the intermittent day; and in quartan fevers on the two days of apyrexia. It appeared advantageous, in order to perfect the cures, to continue the use of the tannate in decreasing doses, even after the fits had disappeared.

It would have been difficult for your committee, even in a much longer time, to collect in Paris a sufficient number of facts for the conclusions to merit confidence. We were fortunate in obtaining the aid of M. P. Hallin, correspondent of the Academy at Montagne (Vendée), of M. Lefevre, surgeon of the marine charged with the service of the bath at Rochefort, and of M. Lambron, Physician at Levroux (Indre), who have been kind enough to put us in a position to fulfil the just requirements of the Academy.

The interesting memoirs of our learned brethren are joined to the present report, and their observations are of the more value as they have been collected in countries where paludian fevers prevail.

We have likewise taken into consideration the official documents collected by Dr. Berthelot, who is already known to the Academy.

The observations collected are 82 in number, viz., 74 cases of well-characterised fever, and 8 of various affections. They have been taken in various countries, comprising the different ages and nearly all conditions of life. They are for the most part accompanied by details which guarantee their accuracy. Care was taken, as regards the fevers, to establish the reality of the diseases, and to determine the order in which the fits succeeded each other.

These observations developed in each memoir, are summed up, with those which belong to ourselves, in a table annexed to our report. They are thus classified:

35 quotidian and remittent fevers,
24 tertian fevers,
12 quartan fevers,
3 symptomatic fevers,
4 intermittent neuralgia,
1 intermittent diarrhœa,
3 acute articular rheumatism.

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82

One quotidian fever was rebellious. M. Lefevre, who observed it, adds, in his conclusions: "In the presence of the positive facts which we have collected, this negative fact is of little value: it is only similar to what has many times occurred when sulphate of quinine itself has been employed."

All the tertian fevers were cured. The tannate failed in two cases of quartan fever, which yielded to sulphate of quinine after the employment of a laxative. A single case of pernicious fever was observed; the tannate relieved it.

It must be remarked that of these 72 cases, of fever, 8 had relapses after the use of the tannate; but it must also be added that in the same number of cases (72) there were 14 relapses after the employment of sulphate of quinine. These facts prove, however, that the tannate is not free from the danger of relapses, any more than the sulphate.

The three symptomatic fevers were not cured by the tannate; but they likewise resisted the action of sulphate of quinine. The cases of neuralgia, one of which was in the face, were cured.

The intermittent diarrhœa was arrested; no improvement was effected in the cases of rheumatism, except perhaps one of them, observed at the Hospital Beaujon. These negative experiments have enabled us to prove that the tannate may be administered in considerable doses, without producing the more or less serious phenomena which are so frequently manifested when sulphate of quinine is given in the same manner.

To sum up, it results from the facts collected and reported by your committee:

1. That tannate of quinine is an antiperiodic.

2. That it appears to possess, for the same weight, an equal activity, but not superior to that of the officinal sulphate of quinine, for curing intermittent fevers.

3. That, like the sulphate, it is not quite free from the occurrence of relapses.

4. That it presents infinitely less bitterness, which renders its administration easy, even to the most delicate persons and children.

5. That the chemical observations tend to prove that it exerts less action than the

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sulphate of quinine on the digestive organs and nervous system.

6. That as it partakes, according to the observations of M. Barreswil, of the nature of cinchona in its constituent principles, and sulphate of quinine, in the fixity of its composition, so does it resemble both in its therapeutical action.

It must be borne in mind that this new pharmaceutical product, substituted for sulphate of quinine, may, on account of its amorphous and pulverulent state, be more easily adulterated than the sulphate, which is always sold in crystals.

Finally, we may remark, that the experiments given in this report, comprise only one case of pernicious fever, and we think that, although the result was affirmative, too much confidence must not be accorded to tannate of quinine in the treatment of pernicious fevers, until numerous experiments have confirmed this first observation.

With these reservations, we may conclude that tannate of quinine acts on intermittent fevers in the same manner as cinchona and sulphate of quinine, and that it may, in certain cases, be advantageously substituted for the latter substance.

We propose to you to thank the author and to request him to continue his researches, and to communicate the result to the Academy.—*Jl. de Pharmrcie*, Mar. 1852.

ON TINCTURE OF IPECACUANHA.

BY M. G. LEROY, PHARMACEUTIST AT BRUSSELS, MEMBER OF THE LOCAL MEDICAL COMMISSION.

M. LEROY has just addressed to the Medical Academy of Belgium a very interesting work which we hasten to publish.

Officinal medicaments, during repose, or keeping, when placed in such conditions as to preserve them from alteration, are subjected to such profound modifications as to necessitate their being thrown aside.

We are generally led to consider alcoholates, or alchoholic tinctures as amongst the most stable officinal medicaments, by reason of the nature of the vehicle which serves for their preparation. Thus, few pharmacologists have remarked the alterations which they undergo.

Amongst those who have studied them I will quote particularly:—

1st. Baumé, who has remarked that tincture of saffron deposits a matter analogous to amber.—(*Eléments de Pharmacie*, 2nd edition, 1769.)

2nd. Guibourt, who presented to the *Academie de Médecine*, of Paris, some observations on the changes in composition, which tincture of iodine undergoes, in proportion to the length of time which elapses from its preparation.

3rd. Mr. Bastick, wishing to ascertain the alterations to which alcoholic preparations are liable, placed different tinctures for several months in the conditions in which they would be placed in a shop, that is exposed to a temperature, varying from 60° to 80° F., in half filled bottles, admitting air from time to time.

On examining them some time after, he found that the greater part had undergone acetous fermentation, in a greater or less degree, and that the alcohol had gradually become converted into acetic acid. The tinctures generally had lost their color and taste, and contained *a precipitate which was in part re-soluble*, in a proportion of alcohol corresponding to that which had been decomposed.—(*Pharmaceutical Journal*, 1848.)

Alcoholates prepared with weak alcohol are the most subject to this kind of alteration.

4th. Tincture of kino becomes so much modified by time as to pass from the liquid state into that of jelly. This change of state is even an excellent test for ascertaining if catechu has been substituted for kino in this preparation.—(*Dorvault, L'Officine*, 1850, 3rd Edition*).

Generally pharmacologists consider that tinctures only deteriorate by the evaporation of the alcohol, which serves as a vehicle, and that the effect of this evaporation is to concenerate them too much, and to cause the precipitation of a portion of the principles held in solution.

I do not entirely coincide in this opinion; I am led to think, on the contrary, that in many cases the precipitates formed in tinctures have another cause than the evaporation of a part of the vehicle, and that is a modification which takes place in a portion of the principles held in solution, and which, becoming less soluble, are precipitated.

In the number of these precipitates I place that which is deposited in an almost continuous manner in tincture of ipecacuanha.

Pharmaceutists in general know that this tincture, shortly after its preparation, abandons a very light yellowish white de-

* I have ascertained this fact in the course of more than eighteen years, and reported it in the *Journal de Pharmacologie*, 1815.

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posit, which daily increases; if it is separated by filtration, a fresh deposit is soon perceived to be forming, which again requires filtration.

It is only after three or four filtrations, at intervals of four or five weeks, that the formation of this deposit terminates.

In the course of last July, I prepared, according to the Belgian Pharmacopæia, and with the proportions therein indicated, some tincture of ipecacuanha to serve for the preparation of the syrup of the same name.

Wishing to follow the different phases which it presented, and to study as far as possible, the nature of the precipitate which forms it, for I do not know that any one has hitherto directed his researches towards the subject, I profited by opportunities which this preparation offered me.

About six weeks after its preparation, this tincture contained a very abundant, very light, yellowish white deposit, which rose when shaken.

I left the precipitate to form anew; after some days I decanted the clear liquor, and put the deposit on a filter. The liquor which was decanted and filtered was united and replaced in the phial.

The precipitate collected on the filter was washed several times, I put it to dry spontaneously, but perceiving, after twenty-four hours it became a prey to a multitude of small cryptogami, in the same manner as animal gelatine when dried slowly in the air, I hastened the dessiccation by carrying the filter into a temperature of from 86° to 95° F.

The deposit, during dessiccation, became dishydrated, changed color, passing to a brownish red, and was slightly translucid; when very dry it was friable.

The quantity obtained from this first filtration weighed 5 grains of the Belgian Pharmacopœia, or 0.3250.10 milligrammes; from 1 ounce or 32 grammes of roots used towards the end of October, I collected, as before, the new deposit which formed; it weighed 1 grain of the Belgian Pharmacopæia, or 0.065 milligrammes.

Now, at the end of November, a third deposit was formed, and will be collected, to be united with the others.

During the whole time the tincture had no perceptible action either on blue or reddened litmus paper.

Physical properties of the precipitate.—It is solid, friable, of a reddish brown color, slightly translucid and tasteless.

Chemical properties.—Ether, alcohol and water, whether cold or boiling, are without action on it; dilute hydrochloric, sulphuric and nitric acids, are without action when cold.

Cold concentrated nitric acid does not appear to have any action, but when boiling it attacks it powerfully, coloring it of a brownish red.

Placed in a glass tube closed at one extremity only, and the open end covered with two pieces of litmus paper, one became red, the other blue. If the tube be placed in a spirit lamp, after a few moments the matter swells, and restores the blue color to the reddened litmus paper.

Placed on a sheet of platinum, and exposed to the flame of a spirit lamp, it swelled, diffusing a strong odor of burning animal matter; it burned without flame, and left, as a residue, a white ash. This ash, treated by re-agents, had all the characters of lime.

As seen by this short account, this deposit is by no means a product which would be the result of the evaporation of a portion of the alcohol which held in solution the principles precipitated, but a peculiar organic matter united with lime, which is formed at the expense of a nitrogenous principle contained in the roots of the ipecacuanha. What is the nitrogenous principle which aids in the formation of this substance? It is certainly not one ordinarily met with in vegetables, or the fact observed with respect to tincture of ipecacuanha would be perceived in tinctures made with other roots.

Can it be the result of the decomposition of the *emetine*? This is a research which has still to be made. If so, tincture of ipecacuanha is rightly considered as a medicament which cannot be depended on.

From the characters assigned by M. Willigk to his ipecacuanhic acid, as well as to the tribasic salt of lead (*Journal de Chimie et de Pharmacie*, October, 1851), on a first reading, and without having then made any serious researches on the subject, I was led to think that the precipitate might be due to a union of this acid with lime But the analysis made of it by that gentleman, which denotes the absence of nitrogen from its composition, did not permit me to retain this idea.

As may be easily imagined, these researches are far from complete, not having had sufficient precipitate at my disposal. But, whilst waiting for additional researches, I would not delay making known to the scientific world a fact which appeared to me extraordinary, and, hitherto, unique, and at the same time calling to it the attention of men better situated than I am for the pursuit of such investigations.—*Journal de Chimie Médicale*, April, 1852.

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ON THE SOLUBLE IODIDE OF STARCH, AND THE PROCESS FOR PREPARING IT.

BY M. ANT. SEPUT, PHARMACEUTIST AT CONSTANTINOPLE.

M. QUESNEVILLE, by a process, the secret of which he alone knows, prepares a soluble iodide of starch, and likewise a syrup of the same iodide, which has been for some time used in medicine. This compound is a black powder. Its solution is of a violet blue.

The iodide of starch obtained by the processes mentioned in some chemical works not being identical with the new product invented by M. Quesneville, I was obliged to make some investigations so as to discover the manner of the preparation. After many endeavors, which made me acquainted with the nature of this, I struck upon an easy and economical process of preparing it, which I now lay before my readers.

In attentively examining the characters of M. Quesneville's compound, I soon perceived that it could not be regarded as a simple iodide of starch, for I have always observed that iodide of starch, properly so called, whether insoluble or soluble, is distinguished by the characteristic color of its solution, which is a perfect blue. It is, at least, under this form that it has always appeared whenever I have sought to combine iodine with starch by means which did not alter the state of the fecula. Neither should the compound in question be considered an iodide of dextrine, for the action of iodine on a solution of dextrine produces a purple red. I consequently thought that it might be a mixture of iodide of starch and iodide of dextrine, and I was convinced of it when by the mixture of the two iodides I obtained a solution of a magnificent violet blue. It was thus that I at length obtained M. Quesneville's iodide, which should be called iodide of starch and dextrine.

Having ascertained the nature of M. Quesneville's product by its distinctive characteristics, I had still to find a good method of preparing it directly without being obliged to obtain it by the mixture of the two iodides, which is complicated and inconvenient. I therefore effected the combination of iodine and starch, under the influence of heat; and after some trials to make sure of success in the operation, I fixed upon the following process. As to the proportions of iodine and starch, I based them on the publication of the author. The following is my process:—

R Iodine.....	5	grammes.
Starch.....	45	,,

The iodine is first reduced to a fine powder in a porcelain mortar; the starch is then added by degrees, continuing the trituration, so that the two substances may be intimately mixed. This done, the mixture is placed in a matrass, which is slightly corked, and heated in a sand bath at from 176° to 212° F. for half-an-hour, or until the two bodies are combined. Then the mass, which had been of a reddish grey, becomes black. The product is removed, put into a porcelain capsule, and heated again on an oil bath, raising the temperature from 266° to 284° F.; some of it is mixed from time to time, and the operation is concluded as soon as the iodide has become soluble, and has acquired a fine violet blue color. The trial may be made on a white plate, by putting a small quantity on it with a few drops of water, and dissolving it completely in it, so as to judge of its color, for the iodide of dextrine, being the most soluble, dissolves first, giving a very deep violet color, but which disappears afterwards in the intense blue of the iodide of starch, which dissolves in its turn. The operation takes a shorter or longer time, according to the quantity of substance used; but it is important to mention again, that it should be stopped as soon as the mass has acquired the desired qualities, otherwise the whole would be reduced into iodide of dextrine.

This iodide resists a heat of 320° F. without decomposing. But it is remarkable that free starch, to be converted into dextrine, requires a heat of 392° F., whereas, combined with iodine in the state of iodide, this transformation may take place even at 266° F. To observe this fact well, I submitted at the same time free starch and starch combined with iodine to a heat of 275° F.; after its transformation into iodide of dextrine I examined the free starch, and it showed no alteration.

Now, starch in combination with iodine, by the action of a suitable degree of heat, is rapidly transformed into iodide of dextrine; nevertheless, at a moderate temperature of about 221° to 230° F., but prolonged, it becomes completely soluble, without becoming thus transformed, and its solution is of the pure blue color peculiar to it.

The syrup of iodide of starch made by M. Quesneville may be made with iodide thus prepared, in the following proportions, as described by himself in his prospectus:

Iodide of starch....	50	grammes.
Hot water.....	650	,,
Pulverised white sugar.....	1300	,,

The iodide is dissolved in the water, the sugar is melted in the solution at a heat of

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167° F. in the sand bath, and then passed through a clean cloth.

This syrup is of a magnificent violet blue color, and differs in no one respect from that of the author. I ought, however, to mention, that at the moment of its preparation it is of a thick consistence, which it loses after a month of repose, and it then flows in the same manner as M. Quesneville's syrup.

M. Quesneville's prospectus contains an article extracted from a medical journal published in Paris, in which the following paragraph occurs:—

"It is necessary that these preparations should be well made, for if they were to contain any free iodine they would be dangerous. We therefore advise all practitioners to prescribe the products prepared by M. Quesneville himself, and secured with his seal, for he alone knows the secret of this preparation, of which he is the inventor."

It is easily seen that no free iodine can exist in the compound obtained by the process which I give, when we remember that this body in a free state cannot resist the action of a temperature of 266° without passing off in a state of vapor.—*Journal de Pharmacie et de Chimie*, March, 1852.

SYRUP OF ACONITE.

BY M. FERRAND.

This syrup is prepared without heat, and by simple mixture with alcoholate of aconite, the richness of which in alcoholic extract being previously ascertained, permits us to obtain always an identical product, and offering in all cases a number of conditions which are not found in syrup made with the extract, the opolic syrup itself, and for a good reason, the recipe for this same opolic syrup given for 30 grammes in our formularies—that is to say, to be made extemporaneously — presents an error in weight of active matter of 18 per cent. too much.

This precaution of previous estimation has not only the advantage of giving more certainty, but removes a very serious question in pharmacology—that of the infidelity of composition of more or less aqueous juices and tinctures made by simple maceration, both containing, as has been often proved, very variable quantities of extract, according to the richness of the primary matter, the temperature of the place, and the more or less completeness of the pressure employed.

This remark, very important in itself, can alone explain to us, to cite but one example, the difference observed between the tincture of aconite, which is often declared defective, and the alcoholic extract, which is generally very efficacious; both prepared with the dried leaf, the alcohol being of the same degree of strength, and used in corresponding proportions.

I therefore prepare a syrup, containing in 50 grammes a quantity of alcoholate, the proportion of extract in which has been already ascertained, and which is therefore capable of exactly representing the doses of aconitic preparations usually given in the course of a day.

The general doses of this syrup, which is primarily modifiable according to the indications which have to be attended to, are from two to three teaspoonfuls for children. In the particular case of chronic rheumatism, the use of it must be continued for one or two months, gradually raising the dose from two to six, or even eight teaspoonfuls in the day.—*Bulletin de Thérapeutique.*

EDITOR'S NOTE.—It is known that the *syrups of aconite* are prepared with alcoholised juice of aconite, according to the following formulæ:—

		Gram.
1st.	Alcoholised aconite juice	61
	Powdered white sugar	459
	Distilled water	214
2nd.	Alcoholised aconite juice	80 dps.
	Simple syrup	214 gr.

The alcoholised aconite juice is obtained by taking of fresh and filtered aconite juice 100 parts; alcohol at 33°, 100 parts.—*Journal de Chimie Médicale*, April, 1852.

REPORT MADE TO THE SOCIETE DE PHARMACIE ON THE EXTRACTS PREPARED IN VACUO BY M. GRANDVAL.

BY A COMMITTEE COMPOSED OF MM. ROBINET, GOBLEY, AND DUBLANC (REPORTER).

A SINGLE word at once recals to the mind of pharmaceutical chemists one of the most interesting and the most useful means at the disposal of medicine, and one of the most delicate preparations, and most worthy of the enlightened and attentive regard of the pharmaceutical art. This word is that of *Extract.*

Although it is unnecessary here to reproduce a definition which has so frequently been given, an extract is destined to represent the most active parts of the substances from which it is extracted, whether vegetable or animal, and which furnish

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them from their juices, or by the aid of solvents chosen for the proposed object.

The use of extracts proceeds naturally from the advantage they possess of presenting, in a greatly reduced bulk, the active matter of a much more considerable quantity of substance.

This difference in the proportions of the extract and the substance has its range of comparison from 1 to 3 per cent. in the stalk of the lettuce, in leaves of belladonna, and other things taken in the fresh state; from 14 to 20 per cent. in the roots of rhatany, ipecacuanha, cinchona, and other dry substances.

Since extracts are the concentrated principles of the substances from which they are extracted, it is therefore incontestibly necessary that these principles, in the artificial condition into which they are brought by art, should faithfully represent the bodies which furnish them; and that their properties and effects correspond with them, with no other difference than the proportions in which they are substituted for the substances themselves. These conditions, which should be united in extracts in order to justify the rank which they occupy in therapeutics, constitute a true problem, the investigation of which has occupied the attention of pharmacologists of all ages, the most skilful and the most scrupulous practitioners.

The elements, principles, or materials which exist in organic matters, and to which are attributed the different properties which they exert on the economy, are endowed with a mobility which too frequently renders them liable to undergo alterations from the least expected and least powerful causes. The most alterable of these principles are not always the most active, because they appear to be defended by a better defined or more stable chemical constitution. But there are others by the side of these which are transformed by slight causes, and under slight influences, thus losing the relations of composition, by virtue of which the special properties are manifested.

These are the relations which it is required to maintain, when a substance is passed from its natural form to the state of extract, because from that results the great conformity of action between the substance and the body destined to represent it.

When a liquid charged with organic principles is submitted to evaporation in order to concentrate it, it is given up to the action of physical agents, such as heat and air, which have more or less influence on it, and produce more or less profound alterations in the evaporated liquid. It is thus that we see sugar in solution change its nature, and cease to be crystallisable, or albumen lose its great solubility. By the simple effect of time starch is converted into dextrine, and dextrine into glucose, as the same phenomena would have occurred by means of diastase or other agents.

It is a susceptibility of this nature in the principles which constitute the extracts which it is necessary to be careful of and to preserve in all cases in which they are prepared.

As far back as the tradition of the art carries us, we find pharmaceutists preoccupied with the alteration of extracts, and seeking the means of preventing it.

The direct action of heat, that of the sand bath, rapid ebullition, evaporation favored by motion, or accelerated by currents of air, were the first processes put in practice for reducing liquids and furnishing extracts.

However, it has always been observed that the products obtained by one or other of these processes contain in themselves certain characters which show some change in the nature of the principles dissolved. This is because the effects, rapidly produced by a high temperature, are also produced at a lower, but prolonged temperature; and because the effects of heat are met with again in the effects of time, and because the air, which interferes in all operations, in all cases produces its physical influence and chemical action.

Industry has come forward to elucidate the observation of the arts, and to give an impulse and direction to the timid and fitful progress of pharmacy.

It had been proved, during the glorious efforts of which beet-root sugar was the subject, that slow evaporation, at a temperature below boiling, by heating with steam, far from keeping sugar crystallisable, destroyed it completely, and gave syrups of a deeper color than those obtained by boiling. It was likewise known that a brisk ebullition of eight or ten minutes destroyed less sugar, and colored the syrups less than boiling from 30 to 45 hours.

This was the starting point of observation for the genius of all the men who have so quickly effected and carried so far the improvements necessary for the preservation of the crystallisable sugar in beet-root juice. —*Journal de Pharmacie*, March, 1852.

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Review.

THE PRINCIPLES OF CHEMISTRY, ILLUSTRATED BY SIMPLE EXPERIMENTS. By Dr. Julius Adolph Stöckhardt, Professor in the Royal Academy of Agriculture at Tharand, and Royal Inspector of Medicine in Saxony. Translated from the fifth German edition, by C. H. Peirce, M.D. New Edition, carefully revised. London: Henry G. Bohn. pp. 520.

The public, already so greatly indebted to Mr. Bohn for a supply of valuable works at very low prices, has, in the work before us, incurred an additional obligation. This work, which has for some time enjoyed a deserved popularity in Germany and in America, is written in so easy and agreeable a manner that it must soon be in the hands of every beginner of chemistry, and we recommend all such to procure a copy of it at once, and to read it carefully and perform the experiments described in it; when they have done this, they will have a very good knowledge of the science, and may, if they please, then resort to the larger treatises. It is quite unnecessary for us to give an outline of the plan of the work; we recommend all who desire to obtain a respectable knowledge of chemistry to procure it.

In order to give an idea of the agreeable style of Dr. Stöckhardt's book, we give the following extract (the opening chapter), from which it will be seen that the commencement of the work is of a nature to induce perseverance in its perusal, and not, like too many learned treatises, to appal with its unnecessary array of difficult words and parade of abstruse diction.

"CHEMICAL ACTION.

"1. Every one knows that iron, heated to redness, changes into scales or cinders, and that, exposed to moist air or earth, it is converted into rust; that the expressed juice of the grape gradually turns to wine, and this, again, to vinegar; that wood in a stove or oil in a lamp, disappears in burning; and that animal and vegetable substances in time putrify, disintegrate and finally disappear.

"Iron cinders and rust are iron altered in constitution; iron is hard, tenacious, of a greyish-white color, and brilliant; by heating to redness it becomes black, dull and brittle; on exposure to moisture it is converted into a powder of a yellowish brown color. Wine is altered *must*, in which nothing of the sweet taste peculiar to the grape juice can be perceived; but it has acquired a spirituous flavor, together with a heating and intoxicating power, which were not in the *must*. Vinegar is altered wine; it has an acid taste and smell, and lost its spirituous flavor, as well as its exhilarating properties, its tendency being rather cooling and sedative. Search must be made in the air for the oil and wood which have disappeared during combustion; both these substances are converted into vapor or gas, and heat and light are thereupon evolved with the phenomenon of fire. Of a similar nature are the changes which animal and vegetable substances undergo, if kept for a sufficient length of time; they are gradually converted, as they putrify or decay, into various kinds of gas, some of which emit a very disagreeable odor.

"Such processes, by which the weight, form, solidity, color, taste, smell and action of the substances become changed, so that new bodies with quite different properties are formed from the old, are called *chemical processes*, or *chemical action*.

"2. Wherever we look upon our earth, chemical action is taking place, on the land, in the air, or in the depths of the sea. The hard basalt, the glass-like lava, become gradually soft, their dark color passes into lighter, they crumble to smaller and smaller pieces, and are finally changed to earth. A potato placed in the earth grows soft, loses its mealy taste, becomes sweet, and finally decays The bud, that sends forth a sickly pale shoot in a cellar, when exposed to the light and air grows up a vigorous, firm and green plant, which, imbibing its nourishment from the moist air and soil, forms from their elements new bodies, not to be found previously in the water or the air. A delicate network of cells and tubes pervades the whole plant, imparting to it firmness; these we call vegetable tissue, or woody fibre. We find in the sap, which passes up and down through these cells, albumen and other viscous substances; in the leaves and in the stalks, a green coloring matter—chlorophylle; and in the ripe tubers, a mealy substance—starch. None of these substances are injurious to health; but if the potatoes grow in the dark and without soil, for instance, in the cellar, there is produced in their long pale shoots a very poisonous body—solanine.

"The potato forms one of our most important articles of food. The starch contained in it is not soluble in water, but when received into the stomach, quickly undergoes such a change that it can be dissolved or digested, and then introduced as a liquid into the blood. The blood comes in contact in the lungs with the inhaled air; the blood changes its color, the air changes its constitution, and the heat which

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we feel in our bodies is developed. We must conclude, from these changes, that chemical action is going on in our bodies.

"3. As long as a plant or an animal lives, the chemical processes are under the guardianship of a higher mysterious power, which is called the *vital force*, and by which they are constrained to furnish the materials for the structure of the animal or vegetable forces. The vital force is, as it were, the architect who plans the building, and sees that the requisite materials are procured by the chemical processes, and worked up according to his will. Hereupon arise innumerable new bodies, which cannot be artificially imitated, as, for example, wood, sugar, starch, fat, gelatine, flesh, etc. They are called *organic compounds*, or animal and vegetable substances, in opposition to *inorganic* or mineral bodies, which may be artificially imitated by putting together their constituent parts. When life in an animal or vegetable ceases, the chemical powers obtain the mastery, and then, as if they were the grave diggers of nature, fulfill the old motto,—"Earth to earth and dust to dust." The leaves of the potato plant become yellow, and then brown; they fall off and are gradually converted into a dark powdery substance—humus. In the course of time even this disappears, with the exception of a little ashes, which cannot take flight with the rest. What here it takes years to bring to pass, happens in minutes if we throw the dry leaves into the fire. The chemical action is in both cases quite similar—the only difference consists in the time in which it is effected: it goes on rapidly, as combustion, under a strong heat, and slowly, as a process of decay, at a moderate temperature. But what appears to us annihilation is only change. The substances which have been, not annihilated, but only rendered invisible by combustion or decay, we find again under another form, with exactly the same weight, in the air; from the air, they are again drawn down to the earth by the chemical processes going on in living plants.

"4. We see from this how the inscrutable power of the Almighty appointed the chemical processes for His servants, in order, by their agency, to procure the eternal vicissitude which we daily observe around us in all nature, and to call forth evermore in uninterrupted succession, new life from death; thus it is self-evident how improving and instructive for every thinking man must be that science which explains to him this vicissitude, and opens to him a clearer insight into the wonders of creation.

"This deeper insight will not only lead the mind of man to higher improvement and perfection, but must also fill it with greater admiration and profounder reverence for Him who revealed to us in these wonders His unsearchable omnipotence and wisdom.

"In another point of view, the interest in chemical knowledge will be most powerfully excited by the useful application which can be made of it in every-day life. Chemistry teaches the apothecary how to compound and prepare his medicines; it teaches the physician how to cure maladies by means of those medicines; it not only shows the miner the metals concealed in rocks, but aids him also in smelting and working them. Chemistry, in connexion with physics, has been the principal lever by which so many arts and trades have been brought to such a degree of perfection within the last few decades, and by its means we have been supplied with the numberless conveniences of life which were not enjoyed by our fathers. It cannot be doubted that the farmer must at once regard chemistry as his indispensable friend, for it is this alone which acquaints him with the constituent parts of his soil, with the proper nutriment of the plants he wishes to cultivate, and the means whereby he can enhance the fruitfulness of his fields.

"5. *Chemical Force or Affinity.*—If a piece of iron be heated to redness, till a thick crust of scales is formed around it, and then weighed, it will be found to have increased in weight; consequently, it must have been supplied with something ponderable from the air. This ponderable substance is a species of gas called oxygen: by its union with the iron it has become fixed, yet by other chemical processes it can be reconverted into the gaseous form. If this crust of iron be now exposed for a time to moist air, it will gradually become rust, and again weigh more than before; it has attracted and united to itself water, and more oxygen from the air. Accordingly the crust consists of iron and oxygen; the rust, of iron, oxygen and water, which have become most closely united with each other; they are chemically combined. There is a peculiar power, which is considered the cause of this intimate union, as, in general, of all chemical changes; it is called *chemical power* or *affinity*, and bodies that possess this capacity of uniting with each other, are said to have an affinity for each other. Accordingly, iron at a red heat, has an affinity for the oxygen of the air, and at the ordinary temperature it also has an affinity for water. A gold coin changes neither color nor weight, whether at a red heat, or exposed

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to moisture; we thence conclude that gold has no affinity for oxygen or for water.

"6. A force cannot be seen or grasped; we notice it only in the effects which it produces. If we would know whether a piece of steel possesses magnetic power, we apply a needle, and try whether this is attracted by it or not; we then conclude from its behavior as to the absence or presence of magnetism. Precisely the same course, that of *experiment*, must be taken, in order to become acquainted with the chemical forces, the affinities of bodies for each other. Every experiment is a question put to a body, the answer to which, we receive through a phenomenon, that is, through a change which we observe, sometimes by the sight or the smell, sometimes by the other senses. The question has just been put to iron and gold, whether they have an affinity for oxygen; the iron converted into black oxide, gave an answer to this question, the unchangeable gold did not. Every change which we perceive, every new property which we observe in a body, is a letter in the language of chemistry. To learn this easily and thoroughly, it is above all things necessary for the beginner to exercise himself in spelling, that is in making experiments. To give directions for this is the object of the present little work. Those experiments only have been introduced, which, on the one hand, can be performed easily, safely, and without great expense, and on the other hand, seem best adapted to illustrate the chemical doctrines and laws, and to impress them on the memory.

"7. There are *four leading questions* which the chemist puts to the different natural bodies.

"*a). Of what are they composed?*—Take for instance a piece of bone. How is it affected when strongly heated in a furnace? It becomes whiter, lighter and less solid than before (bone ashes). But how is it affected when heated in a covered vessel? It becomes lighter and black (bone black). If exposed to boiling water, or to steam, how is it affected? It becomes lighter and remains white; but in the water is dissolved gelatine. How in muriatic acid? It becomes transparent; the bone earth is dissolved, and a gristly mass remains, which, when boiled in water, turns to gelatine. What is the action of fire upon gelatine? In a covered vessel it is converted into charcoal, in an open one it burns and disappears. These few experiments shew that the bone contains gelatine which is combustible, and an earth which is not so; they shew, at the same time, that it is the carbonised gelatine which, in the second experiment, colors the bone earth black, and makes it bone-black; that this gelatine dissolves in water, but not in muriatic acid, etc. Gelatine and bone earth are called the *proximate constituents* of bone, but by continued chemical processes these can be resolved still further, that is, separated into simpler constituents. In bone earth are found phosphorus, a metal (calcium), and oxygen; in the gelatine, besides carbon, three other bodies, oxygen, hydrogen and nitrogen. These bodies can be decomposed no further by any known method of analysis, and are therefore called *simple bodies, chemical* or *ultimate elements*; there are now about sixty known elements, and every year adds to their number; but this increase is of little importance to chemical science or its applications, for it consists of elements which but very seldom occur. This separating of compound bodies into simple ones is designated by the name of *analysis.*

"*b). What changes do bodies undergo when placed in contact with other bodies?*—Phosphorus, which is obtained from bones, is luminous in the air, and is gradually converted into an acid liquid; it unites with the oxygen of the air, as the iron did on being heated to redness. If the phosphorus is gently heated, this union is attended with a vivid combustion, and there is formed an acid body which is different from the former; to which, if chalk be added, a new body is formed, very similar to bone ashes; it is, in fact, artificial bone ashes. The number of new bodies which may be produced by the union of the elements with each other, or with compound bodies, is infinite; and entirely different substances are formed, according as the combination takes place under the influence of cold or heat, in water or in air, in greater or smaller quantities. This is *combination* or *synthesis.*

"*c). What useful applications can be made of chemical theory and practice?*—When the chemist discovers a new body, or a new property in one already known, or a new method of synthesis or analysis, he imparts his discovery to the apothecary, the physician, the farmer, the manufacturer and the tradesman, that experiments may be instituted for the purpose of ascertaining whether any advantage, facility, or improvement, can be derived for pharmacy, medicine, agriculture, or the arts. Phosphorus ignites spontaneously at a gentle heat; it is used in lucifer matches. Taken into the stomach it acts as a violent poison; it is at present the most common.

"*d). What are the causes of chemical*

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changes and according to what laws do they take place?—If chemical experiments are performed as they should be, with the balance in the hand, it will soon be observed that when two different bodies which can unite with each other are brought together, sometimes a part of the one, sometimes a part of the other, remains free. Further experiments will show how much of one body, in weight, can be united with the other. If all bodies are tested in the same manner, the certainty is finally attained, that all chemical combinations take place only in fixed, unchangeable, proportions, and that to every individual body is assigned a definite weight, with which it always enters into any combination whatever. This certainty is called a *natural law*. Many such laws of nature have already been ascertained, and they serve as a certain guide to the chemist in his labors, since they cannot, like human laws, be arbitrarily evaded or changed. By them alone we attain to a scientific insight into chemical processes, and to the capability of putting direct questions to bodies by experiment, and of testing the truth of the answers received. An explanation of chemical processes based on natural laws which presents a clear idea of the subject to the mind is called a *Theory*."

POISONING BY ACONITE.

BY DR. SCHABEL.

A CHILD of seven years of age having eaten some leaves of this plant in the garden, mistaking them for sorrel, was taken with vomitings, strong congestion towards the head and slight delirium. An emetic composed of sulphate of zinc and ipecacuanha was followed by marked relief. The pain in the stomach and intestines diminished, the belly was no longer painful when pressed, but the child remained in a soporific state which lasted seven days, during which it was difficult to obtain a reply: deglutition appeared painful, the extremities cold and damp, and the head very hot; the pulse quick and vibrating; the pupils fixed; suppression of urine and stools.

On the third day there was perceptibly an infiltration throughout the whole body from the head to the feet, which continued until the tenth day. During this time, symptoms of hydrocephalus appeared, amongst others, slight convulsions. Digitalis, calomel, flowers of zinc, etc.; friction on the head with stibial ointment, were followed by complete success.

According to the account of the head of the school where this case of poisoning occurred, a similar instance had taken place two years before. A child who had eaten some leaves of blue monk's hood, had œdema of the whole body and convulsions in the course of the complaint. He likewise recovered.

The cerebral symptons which predominated in these cases of poisoning by aconite, confirm the experience of homœopaths, who, according to their principle, regard the *aconitum napellus* as a specific in inflamations in general, and chiefly in congestions towards the head, in which cases it efficaciously replaces bleeding.

The general œdema, which the author attributes to a peculiar action of the aconite on the external skin, appears to us due rather to complete suppression of urine and the stools, at least, in the first case.—*Journal de Chimie Médicale*, April, 1852.

BOOK RECEIVED.

The New York Journal of Pharmacy; Nos. 1 to 3, in exchange. Will the Editors of this periodical kindly inform us to whom in London we may send THE CHEMIST for them, and it shall be regularly forwarded.

TO CORRESPONDENTS.

Mr. Ross's Letter had been mislaid. We will write to him.

"E. H." will be answered in onr next.

"A Constant Subscriber" asks who are the manufacturers of Carneot. We shall feel obliged by any of our correspondents enabling us to answer this question. If "a Constant Subscriber" will forward his address, it may enable us to reply to his questions before the publication of our next number.

The next number of THE CHEMIST will contain a very interesting biography of Van Helmont.

Notice—[As we have heard of more than one instance in which books sent to us for review have not reached us, we shall feel much obliged if those who have sent us books, of which we have not acknowledged the receipt, will communicate with us on the subject.]

NOTICE.—*All Communications, Books for Review and Substance for Notice must be addressed* "To the Editors of THE CHEMIST, care of Messrs. W. & T. Piper, Paternoster Row, London." *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following No. will in future be received as late as the 20th.*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

CHEMICAL RESEARCHES ON THE FATTY MATTERS OF THE VENOUS BLOOD OF MAN.

BY M. GOBLEY.

THE analysis of the blood is one of those which present unquestionably the greatest importance. It is the only rational basis on which physiologists can rely for ultimately arriving at a knowledge of the mode of nutrition of the various organs of the animal economy, and at an elucidation of the mechanism of the secretions. Do the materials which put these two series of physiological actions in operation enter into the organs ready prepared? Are they, on the contrary, entirely formed in the interior of the tissues? This question, which is one of the most serious of those which have been agitated by naturalists, and which, notwithstanding brilliant researches, still remain unsolved, can only begin to be solved when we have determined with the utmost accuracy what are the constituent principles of the circulating liquid.

It was only in the seventeenth century that the importance of these researches, since illustrated by the names of Boyle, Senac, Rouelle, Bucquet, Fourcroy and Vauquelin, Parmenter and Deyeux, and of so many other chemists, began to be understood.

In our days, the study of the blood has made immense progress. Berzelius, Marcet, Prevost and Dumas, Chevreul, Denis, Le Canu, Dumas, F. Boudet, Andral and Gavarret, Figuier, Becquerel and Rodier, mark in its history a new phase. But if some of the most important principles which it contains have been examined with remarkable accuracy in the state of health and in that of disease, there remains still a vast field of research for physiologists and chemists to explore.

Of the constituent elements of the blood, the fatty matters have appeared to me to require a new examination. Being led to this study by my former researches, I undertook it notwithstanding the difficulties which it presented.

The proportion of fatty matter which the blood contains is very minute, for it scarcely amounts to 3 or 4 per 1000; consequently, I was compelled to procure large masses of this liquid: MM. Cruveilhier, Rayer and Briquet have been kind enough to place at my disposal all that I required for my work, for which I beg leave here to tender them my acknowledgements.

I will commence by recapitulating in a summary manner the works of which this important part of the blood has been the subject.

Hunter and Schwilgué appear to be the first who noticed in the blood the presence of a fatty matter. They presumed, but without being able to prove it, that it contained a fat analogous to the nervous substance.

Afterwards, in 1813,* Berzelius proved *de novo* the existence of a fatty body in the blood, only he thought he might draw from

* Read before the Academy of Medicine, Paris, and referred to a committee composed of MM. Caventou, Chevallier, and Le Canu (reporter), on whose report the Academy gave its approbation to this memoir, and ordered it to be sent to the committee of publication.

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his experiments the conclusion that this substance was formed under the influence of the alcohol and ether which he had employed for obtaining it. M. Chevreul perfectly proved that this opinion could not be sustained, and that the fatty body which Berzelius had detected in the blood really exists in it, that it is not formed under the influence of either alcohol or ether, or under that of nitric or hydrochloric acid, or even of potassa.

In this remarkable work, published in 1823,† M. Chevreul announced that the fatty matter of the fibrine is a crystallisable body, without either acid or alkaline properties, making an emulsion with water, containing phosphorus and giving ammoniacal products.

In 1831, M. Le Canu‡ found in the blood the same phosphuretted substance, and, besides, detected the presence of a fatty body which becomes acid under the influence of potassa.

In the same year, M. Denis* noticed in this liquid, as did MM. Chevreul and Le Canu, a phosphuretted fat, and, moreover, cholesterine; only, he regarded this latter as a morbid product not always existing in the blood.

In 1833, Berzelius,† in operating on the fibrine of the blood of the bullock, proved that the fatty matter of that liquid was very soluble in alcohol, that it reddened litmus, that it did not contain phosphorus, and that it consisted of fatty acids.

M. F. Boudet‡ likewise, in 1833, found in the serum of dried blood, the crystallisable phosphuretted fat; he established in a positive manner the existence of cholesterine in the blood, and noticed, moreover, the presence of a soda soap and that of a new principle which he designated under the name of seroline.

Finally, M. Le Canu,§ in a very remarkable thesis, in which he proposed especially to study the coloring matter of the blood, observed, as regards the fatty matter of that liquid, the presence in the serum, of oleïc and margaric acids, in the free state, and the absence of phosphuretted fat.

When we compare the facts which I have just enumerated, we find that the greatest contradictions exist concerning the nature of the fatty matters of the blood. Among other things the neutral phosphuretted fat which M. Boudet found in the serum was not found by M. Le Canu, who extracted from that liquid oleïc acid and margaric acid in the free state.

The results which I have obtained add new facts to those already known, and without upsetting the experiments of such distinguished chemists, they reconcile their labors and explain their diverse results.

The fatty substance of the blood has the greatest analogy of composition to that which is formed in the yolk of the fowls' egg and in the eggs and soft roe of the carp. I have ascertained that it is formed of oleïne, margarine, cholesterine, lecithine and cerebrine.

OLEINE AND MARGARINE.

I shall commence by indicating the process which I adopted for obtaining all the fatty matter of the blood. This liquid, on leaving the vein, is received in a flask which contains rectified ether, and is strongly agitated; by repose, there comes to the surface a perfectly transparent, slightly yellowish liquid, which is separated and replaced by fresh ether. This treatment is repeated a great number of times, but a period arrives at which no more etherial liquid separates, notwithstanding the ether is in great excess. There are then formed two layers, one inferior, aqueous, and of a very intense red, the other, superior, more bulky, formed especially of fibrine and forming a reticulation in the interstices of which the ether seems to be retained as in a net. The whole is then thrown on a filter; a liquor of a deep red color flows out, whilst the paper retains the fibrinous substance. Both this latter substance and the aqueous liquor are submitted to the action of ether; the ether resulting from all these operations is distilled. By this means we obtain a fatty matter of a yellowish color, which constitutes the product No. 1.

When the two bodies appears to yield no more fatty matter, they are dried separately in the sand-bath, in order to obtain two products: 1st. dried fibrine; 2nd. dried serum.

Dried fibrine.—It was pulverised, treated three times with alcohol of 85° Cartier. The liquors, filtered boiling, were reduced to three-fourths and agitated with ether; this gave a soft viscid substance, which, put in contact with sulphuric ether, was separated into two parts: one forming the product No. 2, soluble, of a reddish brown color,

* *Annales de Chimie*, t. lxxxviii, p. 26.

† *Annales de Muséum d' Histoire Naturelle*, 1823.

‡ *Journal de Pharmacie*, t. xvii, pp. 485 and 545.

* *Experimental Researches on Human Blood.*

† *Traite de Chimie*, t. vii.

‡ *Journal de Pharmacie*, t. xix.

§ *Thesis on Human Blood*, p. 45.

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leaving an acid charcoal by incineration; the other insoluble, white, giving out ammoniacal odors on being decomposed by heat, swelling up in water like starch, and presenting the properties of cerebrine.

As regards the liquid which had been deprived of fatty matter, it did not retain traces of fatty acids, for, treated by acetic acid at the boiling temperature, no fatty globule floated on it by cooling, a blackish grey deposit is formed, on which floats a perfectly clear liquid.

Dried Serum.—It was pulverised and treated three times with boiling alcohol of 85° Cartier. The filtered liquors were evaporated, distilled water was added and they were heated again to drive off the last portions of alcohol; the remaining liquid was agitated in a flask with ether.

The etherial liquid arising from these treatments was of a red color; on being decanted and evaporated, it left a soft viscid substance, of reddish color, constituting product No. 3. As regards the aqueous liquid, it was treated like that of the dried fibrine, and it gave, like it, with acetic acid, a reddish gray deposit, on which floated a perfectly transparent liquor: no globule of fatty matter floated on the liquid.

When the fatty matter obtained by these different means is combined, we find, if we determine its weight, that it may amount to 4 or 5 per 1000. The proportion of fatty matters is therefore more considerable than was supposed.

I have said that oleine and margarine form part of the blood.

The product of No. 1 constitutes a yellowish body which contains phosphorus, and which is formed of cholesterine, lecithine, cerebrine, oleïne and margarine. When it is treated by boiling alcohol of 85° Cartier, the lecithine, cerebrine and cholesterine were dissolved. The alcoholic liquid presented, indeed, after cooling, a great number of brilliant lamellæ, to which a yellow substance adhered; the lamellæ consist of cholesterine, and the yellowish substance lecithine and cerebrine, retaining traces of oleïne and margarine. When the product No. 1 no longer yields cholesterine to alcohol there remains a fatty body which no longer contains phosphorus, and which is formed of oleïne and margarine, for when it is saponified by means of potassa, it yields oleïc and margaric acids.

I will not quit this subject without making known the experiments which I made on bullock's blood.

The fibrine, compressed as much as possible in a cloth, was put in contact several times with ether. The first liquors were formed of a red aqueous solution and of ether having a yellowish tint. After being thus treated three or four times, the ether decanted left, after distillation, a fatty matter which did not contain phosphorus, and which was formed of oleïne, margarine and cholesterine; but if, after having been treated by ether, the fibrine is submitted to the action of boiling alcohol, a phosphuretted fat is separated.

When bullock's blood deprived of fibrine is agitated with ether, the latter gives by evaporation a crystalline substance which does not contain phosphorus, and which is no other than cholesterine mixed with a small quantity of fixed oil. By means of ether, therefore, no phosphuretted substance is extracted from the liquid serum; but if the solid matters be treated with alcohol, we obtain, as with fibrine, phosphuretted fat.

The fatty matter contained in bullock's blood is then of the same nature as that which exists in the venous blood of man.

CHOLESTERINE.

The discovery of cholesterine in the blood is due to M. F. Boudet.

MM. Chevreul and Le Canu had noticed, in this liquid, the existence of a crystallisable phosphuretted fat, similar to that which Vauquelin had studied in the brain. Independently of this substance, M. F. Boudet has admitted the existence of cholesterine. There would be then in the blood two bodies capable of crystallising in large scales, phosphuretted fat and cholesterine.

It is impossible for me to agree in this opinion. The phosphuretted fat of the blood, like that of the yolk of the fowls' egg and of the eggs and soft roe of the carp, is not crystallisable in brilliant, pearly plates: the only body which crystallises in these fats is cholesterine. The phosphuretted substance is soft and viscid, and if the brilliant plates which have been extracted from the blood have always left an acid charcoal, it is owing to the chemists not having employed sufficient means to purify them. Cholesterine is so easily characterised by its crystalline form, by its high melting point, and by potassa exerting no action on it, that it is impossible to confound it with any other substance.

M. F. Boudet extracted from the blood only a very small quantity of cholesterine. Owing to the enormous quantity of liquid which I have employed in my experiments, I have been able to obtain sufficient to subject it to analysis, and to ascertain that its composition is that of the cholesterine of the brain, of the yolk of the fowls' egg and of biliary calculi.

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The following are the results which I obtained :—0·407 gr. of cholesterine furnished 1·269 of carbonic acid, and 0·425 gr. of water, which gives in hundredths :—

Carbon	85·030
Hydrogen	11·602
Oxygen	3·368
	100·000

To obtain cholesterine, the product No. 1 was treated by alcohol, several times, in order to separate cholesterine, the phosphuretted matter, and cerebric matter: the decanted alcohol was abandoned to spontaneous evaporation for 24 hours ; at the end of that time, the liquid was separated from the yellowish crystals which were formed, the latter were treated with alcohol charged with potassa; the boiling liquor was filtered, taking care to reject the fixed fatty matter which was formed at the bottom of the vessel, the crystals were received on a filter and washed with alcohol ; this treatment was repeated several times, and, finally, the cholesterine was purified, first, by dissolving in ether, and afterwards by several solutions and crystallisations in alcohol.

OLEÏC AND MARGARIC ACIDS.

Does the blood contain oleïc and margaric acids combined with soda, as Berzelius and Boudet considered? Or does it contain the fatty acids in the free state, as M. Le Canu supposed ?

The experiments which I have related in speaking of oleïne and margarine have already led to the idea that no soap exists in the blood, for I ought to have found it in the aqueous liquids which I decomposed by acetic acid. Experiment demonstrates indeed that when an aqueous solution of soap is agitated with ether, the oleate and margarate which it contains are not separated.

In order to decide so important a question, I did not wish to rely solely on the experiments which I have just mentioned; I therefore undertook others, which I shall make known successively.

I at first examined the action which peroxide of lead exerts on a solution of soap, thinking that I might find this reagent useful for detecting the fatty acids ; I ascertained that the latter were precipitated in the state of lead salts, and that there remained in the supernatant liquor no trace of either oleïc or margaric acid.

After having established the accuracy of this experiment, I triturated separately the products Nos. 1, 2 and 3, which were referred to in speaking of oleïne and margarine, with distilled water and an excess of protoxide of lead, and in order to be certain of the combination of the latter with the fatty acids which might be found in the mass, I added a certain quantity of basic acetate of lead ; I introduced the mixture into a flask with ether, and agitated it ; I decanted the ether, which had a yellowish tint, and I replaced it with fresh ether until the latter left nothing by evaporation. If either of these products had contained margaric acid, doubtless it was formed from the margarate of lead. Now experiment had shown me that the ether had removed the whole of the fatty matter, and that the residue of lead gave with acetic or hydrochloric acid no trace of margaric acid.

These experiments prevent me, as is evident, from admitting the existence in the blood of oleïc and margaric acids, whether free or combined ; I say oleïc and margaric acids, for margaric acid is never found unaccompanied by oleïc acid.

In order better to support the opinion which I advance, I will make known the experiments which I have made on the serum.

I took serum at the very moment when the clot was formed, and I evaporated it to dryness in a sand-bath ; 200 grammes of this serum, thus dried, were put in contact with distilled water; the whole was boiled and placed on a filter ; the residue was diluted with a further quantity of water and again boiled.

The filtered liquid left by evaporation a great quantity of salts. Heated with alcohol, the saline product furnished a liquor which did not contain soap; if a saponaceous compound had existed in the serum, it ought to have been separated, at least partially. When boiled, the addition of acetic acid, no fatty matter floated on the liquid; a few light flocks separated from the liquor, but no fatty body rose to the surface, even after a very long time.

The residue left on the filter was dried on a sand-bath, powdered and treated twice with boiling alcohol ; the filtered liquors were colorless ; the extract which I obtained from it by evaporation had no action on litmus ; it had a soapy odor and taste; it left by calcination an acid charcoal, dissolved in alcohol and in ether, was divided in water and rendered it frothy as a true soap would do. But did this body constitute a saponaceous compound? To decide this question I added acetic acid to the boiling liquor; flocks were separated, and I perceived oily globules floating on the surface and in the midst of the liquid, but they were not formed of oleïc and margaric acids; they had retained a certain viscidness, and the substance employed did not appear to me

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to have undergone any modification; on cooling, all these globules went to the bottom of the vessel, which margaric and oleïc acids never do.

Not having obtained fatty acids by this means, I treated the alcoholic product by oxide of lead united with the basic acetate, and the lead compound was put in contact with ether. This left as a residue a substance which did not differ from that which had been employed, and the precipitate of lead, decomposed by hydrochloric acid, did not liberate any fatty globules. It is very certain that had margaric acid existed in the body employed, margarate of lead, and, consequently, margaric acid would have been obtained.

From all the experiments which I have just detailed, I have arrived at the conviction that, as I have already said, neither a saponaceous compound nor oleïc and margaric acids exist in the blood.

This opinion will doubtless appear extraordinary, for the skilfulness of the chemists who have noticed the presence of fatty acids in the blood cannot be doubted. I hope to be able presently to point out the source whence those come which have been met with.

LECITHINE.

The phosphuretted matter is not, as I have already said, capable of crystallising. Cholesterine is the only crystallisable body which is found in the fat of the blood. The experiments which I shall now detail will, I hope, prove what I advance.

When the product No. 1 is treated by boiling alcohol, the cholesterine and the phosphuretted matter are dissolved; oleine and margarine alone remain. If we afterwards put in contact with oil of sweet almonds the product of the evaporation of the alcoholic liquid which forms that which I have designated, in former memoirs, under the name of viscid matter, the cholesterine may be dissolved and separated almost entirely from the phosphuretted substance; it is easy then to recognise that the matter left on the filter, after having been pressed between folds of filtering paper, is not capable of crystallising. We may afterwards, by treating the oil with boiling alcohol, obtain the cholesterine.

To separate the cholesterine from the viscid matter, the temperature of the oil must be raised, and the liquid must be agitated frequently, and filtered while hot. The phosphuretted substance is divided in the oil and may be collected on a filter. Sometimes it is so divided that it appears to be dissolved; that occurs when all the water is dissipated, but it is sufficient to agitate with a small quantity of this liquid to separate it. The oil of sweet almonds, in this case, dissolves only cholesterine; it retains no trace of phosphorus.

After having ascertained that the phosphuretted matter is not capable of crystallising, and that the cholesterine which accompanies it alone possesses this property, a very important question remained to be solved. What is the nature of this substance? The experiments to which I have subjected it have demonstrated that it is of the same nature as that which I found in the brain, in the yolk of the fowls's egg, and in the eggs and soft roe of the carp.

It presents a great resistance to decomposition, and, in this respect, it presents the greatest analogy with the fatty matter of the brain.

To prove what are the products of decomposition of the phosphuretted substance of the brain, it must be put into a flask with water strongly acidulated by hydrochloric acid, and must be frequently agitated and left in contact for from 24 to 36 hours; it is afterwards boiled, and when the mixture has acquired a brownish tint, it is allowed to cool, the fat which is found on the surface of the liquid is separated, and is easily recognised to be formed of oleïc and margaric acids.

When instead of treating the viscid matter of the blood by acidulated water, acidulated alcohol is used, the same results are obtained as with that of the yolk of egg: there can be no doubt therefore that it is formed, like the latter, of cerebrine and lecithine.

In order to prove the presence of phosphoglyceric acid, the acid liquor must be saturated with lime, filtered and evaporated; it gives, by the addition of alcohol, a precipitate of phosphoglycerate of lime.

In order that the different phenomena which I have just indicated may be quite manifest, it is necessary to operate on a certain quantity of fatty matter; when only a small proportion of this substance is employed, the reactions are very difficult to observe.

The fat of the blood, obtained by means of ether, does not contain saline substances; cerebrine and lecithine are not therefore found in this fluid in the state of soap.

I have already said that my experiments do not permit me to admit the existence of oleïc and margaric acids in the blood. I will now show how their presence in that liquid may be explained.

I have ascertained that whenever I have abandoned a certain quantity of blood to the influence of putrefaction, the fatty acids

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are formed with the greatest facility. I have also remarked that this transformation sometimes occurs with extreme rapidity; this was the case with fibrine of the bullock taken from the slaughterhouse. In these establishments the blood is collected, as is known, in a kind of vat set in the stone, which can never be kept so clean as that no putrefactive ferment shall remain; now, the fibrine extracted from the blood of a bullock collected in this manner contained, at the expiration of a very short time, fatty acids, whilst that which had been furnished by blood received into a very clean vessel, of glass or porcelain, gave the results which I have pointed out, namely, neither of these acids were found in it.

Since, therefore, putrifaction so readily gives rise to the fatty acids, it is doubtless to this cause that we must attribute those which chemists have observed in the blood.

CEREBRINE.

When the fatty matter is extracted from the blood by the process which I have just pointed out in speaking of oleïne and margarine, we obtain, with product No. 2, a substance which presents the greatest analogy with the body which I have studied in the yolk of the fowls' egg, and in the eggs and soft roe of the carp under the name of cerebrine. It possesses, indeed, all the properties of this substance; it swells up in boiling water, like starch, fuses at a high temperature, and gives ammoniacal products.

Cerebrine separates especially with the fibrine; for it is in this latter that it is most easy to detect its presence.

SEROLINE.

M. F. Boudet, in treating with alcohol dried serum, deprived of the greater part of its salts by means of boiling water, obtained a colorless liquid which becomes turbid by cooling and which very slowly deposits white flocks, which he regarded as a new proximate principle, to which he gave the name of seroline.

Does seroline constitute, as M. Boudet supposes, a peculiar body, a proximate principle? The investigations to which I have subjected it do not admit of my holding this opinion. In order that a body may be regarded as a proximate principle, it is indispensable that, prepared by different processes, and after having been submitted to the action of solvents, it should present the same properties. It is also known that the melting point is one of the best characters by which to recognise the fatty bodies, and that this property is invariable in each of them. Now, seroline does not present this constancy in its properties, and my experiments lead me to regard it as a complex body which would be formed, in most cases, of oleïne, margarine, cholesterine, and of albuminous matters accompanying them.

The fusing point of seroline varies according to the quantity of alcohol employed, and according to its alcoholimetrical degree. Now it is known, as I have just said, that the temperature at which a fully proximate principle melts is always the same, whatever solvent may have been used for obtaining it.

The seroline of M. Boudet gives ammoniacal products. When it is treated with ether and when the liquor is filtered there remains on the paper a small quantity of an insoluble substance containing nitrogen, and which is nothing but albumen. The evaporated liquor gives a matter which contains no nitrogen. The ammonia which seroline furnishes therefore proceeds from the albuminous matter, and, indeed, the fat obtained, heated in a glass tube gives acid products, leaves a slight carbonaceous residue, and volatilises in great part.

The experiments which I have just detailed prove, as it appears to me, that seroline is a complex substance whose existence as a proximate principle of the blood cannot be admitted.

CONCLUSIONS.

I think that I may conclude from my experiments:—

1. That fatty acids do not exist in the blood, either free or combined:

2. That seroline is a complex body whose existence as a proximate principle cannot be admitted:

3. That the composition of the fatty matter of the blood is much more simple than has been supposed; that it is formed of oleïne, margarine, cholesterine, lecithine, and cerebrine:

4. That cholesterine is the only crystallisable substance of the fat of the blood; that it presents the properties and composition of the cholesterine of the yolk of the egg and of biliary calculi:

5. That the phosphuretted matter or lecithine is not capable of crystallising; that it gives, as a product of decomposition, oleïc, margaric and phosphoglyceric acids:

6. That the cerebric matter or cerebrine possesses the properties of that which is found in the yolk of the fowls' egg, and in the eggs and soft roe of the carp; that it contains nitrogen, fuses at a high temperature and swells up in water in the same manner as starch:

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7. That the fatty matters of the blood, under the influence of putrefaction, give, with the greatest facility, oleïc and margaric acids:

8. That bullocks' blood contains the same fatty principles as are met with in that of man. *Journal de Pharmacie*, April, 1842. [For M. Gobley's former memoirs, on the eggs and soft roe of the carp, see THE CHEMIST, New Series, vol. I. pp. 483 and 527, and vol. II. pp. 491 and 535.]

NEW RESEARCHES ON HYPERIODIC ACID AND THE HYPERIODATES.

BY M. LANGLOIS.

(Concluded from page 253.)

HYPERIODATE OF STRONTIA

Is obtained in a similar manner to hyperiodate of baryta, by precipitating a solution of bibasic hyperiodate of soda by means of strontia water; it has likewise the same properties and composition. Red heat transforms it into quinquibasic hyperiodate. Analysed in the same manner as the salt of baryta, by treating it with sulphuric acid, we obtained, by operating on 100 parts, 59·20 of sulphate of strontia, instead of 58·64 which should be obtained, representing its formula as

IO^7, 2SrO, 3HO.

The difference between these two numbers is so slight, that we are led to think that such is the atomic constitution of hyperiodate of strontia.

HYPERIODATE OF LIME.

We prepared it by pouring nitrate of lime into a solution of monobasic hyperiodate of soda. The white precipitate produced is crystalline as seen through a microscope. It behaves, when subjected to the action of heat in the same manner as the hyperiodates of baryta and strontia; water, oxygen and iodine are disengaged, and the residue contains 1 equivalent of acid and 6 equivalents of oxide of calcium. It is composed of IO^7, 2 CaO, 3HO. 100 parts were dried at the temperature of boiling water, and then treated by sulphuric acid, which gave as product, anhydrous sulphate of lime, 44·93; theory indicates 45·35.

HYPERIODATE OF MAGNESIA.

It is too soluble to be obtained by double decomposition by means of a solution of monobasic hyperiodate of soda and a soluble salt of magnesia. We prepared it directly with hyperiodic acid and carbonate of magnesia, which passes entirely into an insoluble hyperiodate, but which an excess of acid succeeds in dissolving, This hyperiodate is formed of small prismatic crystals, very visible in the microscope. Dried at the ordinary temperature, they remain transparent; their composition is:

IO^7, 2MgO, 3HO+8HO.

At the temperature of 212° F., they lose 9 equivalents of water, sublime and take the constitution which we have found in almost all the hyperiodates. This is again, as may be seen, a quinquibasic salt, IO^7, 2MgO, 3HO.

I. 0·195gr. of matter, gave 0·033 of magnesium, or 16·92 per cent.

II. 0·168gr. of the same matter gave 0·028 of oxide of magnesium; or 16·65 per cent.

III. 0·102gr. of the same matter gave 0·017 of oxide of magnesium: or 16·66 per cent.

IV. 0·288 of the same matter gave 0·047 of oxide of magnesium; or 16·32 per cent.

We obtained these results by calcining the salt at a red white heat, in a platinum crucible, in which there remained as residue only oxide of magnesium. Sometimes the proportion of this last oxide was ascertained in the state of sulphate. As for the iodine, we determined the quantity by treating the hyperiodate at a red heat, in a porcelain crucible, by pure carbonate of potassa, so as to produce iodide of potassium, which we then transformed into iodide of silver by means of a solution of nitrate of this metal.

I. 0·203gr. of hyperiodate of magnesia gave 0·190 of iodide of silver, and 0·147 of hyperiodic acid; or 72·41 per cent.

II. 0·196gr. of the same matter gave 0·181 of iodide of silver, and 0·141 of hyperiodic acid; or 72·94 per cent.

A hundred parts of hyperiodate of magnesia, having the above-named composition, IO^7, 2 MgO, 3HO, would give:

Oxide of magnesium.....	16·54
Hyperiodic acid.....	72·72

HYPERIODATE OF ZINC.

It is obtained by treating hydrated carbonate of zinc by hyperiodic acid. The hyperiodate produced has the appearance of a granular powder, which retains no carbonate if the precaution be taken to employ a slight excess of hyperiodic acid. This salt may be kept in a stove heated to from 212° to 248° F. without suffering the slightest alteration. It dissolves readily in distilled water with the addition of a few drops of nitric acid. A yellow precipitate is caused in the solution by nitrate of silver; this

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precipitate is completely soluble in nitric acid.

Its formula is:

IO^7, 4ZnO, HO.

	Per cent.	Experiment.
Hyperiodic acid....	51·96	51·23
Oxide of zinc	45·49	46·20
Water.....	2·55	,,

This hyperiodate, with 4 equivalents of base, dissolves readily in water by means of an excess of acid. The solution, evaporated at a gentle heat, gives lamellar crystals, the composition of which is represented by $2IO^7$, 3ZnO, 7HO. There is then produced, in this case, a sesquibasic salt.

Of oxides of manganese and iron.—In the presence of these oxides, hyperiodic acid is restored to the state of iodic acid. This reaction is followed by the formation of a precipitate of iodate of manganese or iodate of iron.

HYPERIODATE OF LEAD.

It is prepared, as we have already said, by pouring nitrate of lead into a solution of bibasic hyperiodate of soda. The hyperiodate of lead is precipitated in the form of small crystals adhering to each other, very visible through the microscope, but difficult to characterise. They dissolve readily in water containing a few drops of nitric acid. After being dried in the vacuum of the pneumatic machine, over sulphuric acid, they may be brought to a temperature of from 248° to 266° F. without losing weight. The water of crystallisation only escapes when the heat is sufficiently great to decompose them. Exposed to the flame of the lamp with double current, in a tube sealed at one end, they lose water, oxygen, and iodine, and leave as residue a definite compound of iodide and oxide of lead, of which the formula is represented by

PbI, 5PbO.

This compound is already known; its authors gave it the name of *pentabasic iodide of lead.* Its formation will be easily accounted for by admitting, at once, what we shall soon demonstrate, that the hyperiodate of lead is formed of IO^7, 3PbO, 2HO. The following are the results furnished by our experiments:

I. 0·670gr. of matter lost at a red heat 0·172; or 25·67 per cent.

II. 0·815gr. of matter lost at a red heat 0·210; or 25·71 per cent.

III. 1·362gr. of matter lost at a red heat 0.346: or 25·40 per cent.

The loss should have been 26·40 per cent. if, as is to be presumed, 2 equivalents of hyperiodate (IO^7, 3PbO, 2HO) produce at this high temperature,

$(PbI, 5PbO)+O^5+I+4HO$.

We ascertained the per-centage of oxide of lead in the hyperiodate by treating the latter with sulphuric acid, so as to obtain the sulphate.

I. 0·905gr. of matter gave 0·705 of sulphate of lead; or 84·30 per cent.

II. 0·655gr. of matter gave 0·547 of sulphate; or 83·51 per cent.

III. 0·643gr. of matter gave 0·540 of sulphate; or 84·50 per cent.

IV. 0·742gr. of matter gave 0·627 of sulphate; or 84·50 per cent.

V. 0·530gr. of matter gave 0·442 of sulphate; or 83·96 per cent.

The average is 84·05 per cent., a number which is very near the figures 84·70, which would be obtained by adopting for hyperiodate of lead the formula:

IO^7, 3PbO, 2HO.

To determine the quantity of iodine contained in the hyperiodate of lead, we employed several methods; one consisted in subjecting the salt to the action of a boiling solution of caustic potassa; but this method did not give good results; the potassa in these conditions, did not take up the whole of the hyperiodic acid. Binoxide of lead was also produced, proceeding from the reductive property of the hydrated protoxide on the hyperiodate of potassa which is found reduced to the state of iodate.

The proportion of iodine in the hyperiodate of lead may, on the contrary, be well ascertained by exposing this salt, at a red heat, to the action of pure carbonate of potassa. The product of the calcination is dissolved in water and the liquor filtered. By pouring some nitrate of silver into it, there is at first formed a yellow precipitate of silver, and later, this precipitate is white, when it is due to the carbonate of potassa, of which there is always an excess. The addition of the nitrate of silver may be stopped as soon as the white precipitate is perceived; for this is a certain sign that the liquor contains no more iodide of potassium.

We have obtained, as the result of several experiments, 42·20 parts of iodide of silver from 100 parts of hyperiodate of lead. This quantity of iodide represents 23·27 of iodine and 33·54 of hyperiodic acid. Theory indicates the number 34·13.

We may then establish the following approximations:

Hyperiodate of lead, formed of

	Per cent.	Experiment.
3 equivalents of oxide lead, gave.....	62.49	61·83
1 equivalent of hyperiodic acid, gave ..	34·13	33·54
2 equivalents of water, gave	3·38	,,

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We were content, as is seen, to demonstrate the existence of water without seeking its quantity. This investigation would be useless, as we have determined the proportions of base and acid. In this salt 3 equivalents only of the acid have been replaced by an equal number of equivalents of oxide of lead.

HYPERIODATE OF COPPER.

It is obtained by double decomposition, by precipitating a solution of sulphate of copper by monobasic hyperiodate of soda. The liquor retains a considerable quantity of it. It is prepared with less loss by treating hydrated carbonate of copper by a slight excess of hyperiodic acid. In this case, the hyperiodic acid is substituted for the carbonic acid, without dissolving the resulting periodate. Whether obtained by the first or the second process, the salt has always the same composition. Its formula is :

$$4CuO, HO, IO^7.$$

Analysis gives us in 100 parts :

		Theory.
Hyperiodic acid	51·90	52.16
Oxide of copper	45·54	45·27
Water	„	2·57

We have likewise studied the monobasic and bibasic hyperiodates of silver. This last crystallises perfectly, and its crystals have the form of the rhomboïdal prism. These same crystals contain, with the 2 equivalents of base, 3 equivalents of water. Our analysis of these two hyperiodates has added nothing to that of MM. Magnus and Ammermüller.

ON THE ACTION OF HYPERIODIC ACID ON THE ORGANIC AKALIS.

Our only aim in studying hyperiodic acid was at first to investigate how it behaved in the presence of vegetable bases. This study was not made by MM. Magnus and Ammermüller. Hyperiodic acid does not combine easily with organic bases, and the compounds resulting from this union spoil quickly. The difficulty of producing well-determined combinations would have induced us to abandon this work, if we had not thought of attaching to it more complete investigations on the general properties of this acid. It will not therefore cause astonishment when we state that our first attempt to form salts with organic alkalis and hyperiodic acid date some years back. Neither are we surprised to hear that, during the whole of this time, endeavors of a similar nature to ours have been made elsewhere. We find in the *Annuaire* of MM. Laurent and Gerhardt, of the year 1850, that M. Budker, jun., tried to combine hyperiodic acid with the organic alkalis, and that he only succeeded in obtaining a well-defined combination with strychnine. We ourselves, from our first experiments, have observed the easy reaction of this base and hyperiodic acid, and we obtained some crystals in the form of long needles. Although the combination with the other vegetable bases be difficult, it is nevertheless not impossible if the alkaloïd is dissolved in alcohol at the moment that it is to be saturated by the acid.

HYPERIODATE OF QUININE.

Our first attempts were made on hydrated quinine, newly obtained from the sulphate by means of ammonia. We treated it by a solution of hyperiodic acid, which it never saturated completely, although employed in slight excess. This saturation should be made at the ordinary temperature; for, if the heat is a little raised, the acid oxidises the base by becoming transformed into iodic acid. The concentration of the solution of hyperiodate of quinine is very well produced over sulphuric acid in the vacuum of the pneumatic machine. After remaining a short time in the vacuum, the solution becomes covered with a matter of an oily appearance, possessing the adhesive properties of turpentine. This matter, augmenting in difficulty, is not long in being precipitated to the bottom of the vessel, and is then seen under the form of small crystals when all the water has disappeared. These crystals heated on a sheet of platinum, decompose with an explosion, leaving only a slight trace of charcoal. They are very soluble in water; the solution produces a yellow precipitate with nitrate of silver, and the precipitate is entirely soluble in nitric acid, which proves that the hyperiodic acid has, as yet, suffered no alteration. It is not the same after a certain lapse of time; a great part of the acid loses its oxygen, and the crystals, instead of being white, as they were at first, take, after this reaction, a brown tint.

These unsatisfactory results determined us to try another method, which consists in the mutual saturation of two alcoholic solutions, one of the base, the other of the acid. After the saturation, the liquor should be put to evaporate in a stove heated to from 86° to 104° F. On the disappearance of the alcohol, small round masses are produced, from the centre of which a great number of acicular crystals proceed in the form of rays. These crystals are sparingly soluble in water; they dissolve very readily in it by means of a few drops of nitric acid.

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Ammonia and nitrate of silver form precipitates in this solution. That produced by the nitrate of silver is yellow, soluble in nitric acid, which indicates that the hyperiodic acid is not accompanied by iodic acid.

We analysed the hyperiodate of quinine by subjecting it to the action of a solution of sulphurous acid, taking care only to use the exact quantity of this solution necessary to transform the hyperiodic acid into hydriodic acid. We then added nitrate of silver to the liquor to fix the iodine in the state of iodide of silver, which was collected on a filter and washed with boiling water containing a little nitric acid. In this same filtered liquor the quinine and the excess of the nitrate of silver remained. The last metal was easily isolated by hydrochloric acid and the quinine by ammonia.

By operating on hyperiodate of quinine dried in a stove at 104° F., 0·500gr. gave 0·160 of iodide of silver, which represents :

	gr.
Hyperiodic acid	0·1268
Quinine	0·2313
Water (by the difference).	0·1419

This salt would therefore be formed of 1 equivalent of hyperiodic acid, 1 equivalent of quinine and 22 equivalents of water $(C^{38}H^{24}N^{2}HO)\ IO^{7}+22HO$. Indeed from the above results, and the formula which we have just given, we arrive at the following numbers :

	Experiment.	Theory.
Hyperiodic acid per cent. ..	25·36	26·05
Quinine.....	46·25	45·73
Water (by the difference) .. „		28·22

From this same salt, dried at 212° instead of only 104° F., 0·530gr. of matter produced 0·1160 of iodide of silver, and, consequently :

		Experiment.	Theory.
Hyperiodic acid..	0·1463	27·60	28·22
Quinine	0·2650	50·00	49·53
Water.....	0·1187	22·40	22 25

By this dessiccation the hyperiodate lost 4 equivalents of water, and its formula is : $(C^{38}H^{64}N^{2}HO)\ IO^{7}+18HO$.

CINCHONINE.

This base does not behave altogether like quinine in the presence of hyperiodic acid. It is saturated with difficulty, and the liquor always reddens tincture of litmus. Evaporated in the vacuum of the pneumatic machine over sulphuric acid, this liquor presents nearly the same phenomenon as the solution of acid hyperiodate of quinine; it precipitates a resinoïd matter, having the adhesive properties of turpentine. When all the water has disappeared the microscope enables us to see, in the midst of this matter, a crowd of prismatic crystals. After a short time these crystals become yellow, and the acid which they contain is restored to the state of iodic acid. The oxidising action of the hyperiodic acid manifests itself more quickly in cinchonine than in quinine.

The saturation of hyperiodic acid by cinchonine may however be obtained by adopting the same process as for quinine, that is to say by pouring the alcoholic solution of hyperiodic acid into alcohol charged with cinchonine. The neutral liquor, resulting from this mixture, furnishes, by evaporation at a gentle heat, very short, prismatic crystals, altered by the air as soon as they cease to be covered with liquid. By a rather prolonged contact with the air they take a yellow tint and the hyperiodic acid is in great measure transformed into iodic acid. The reduction may be complete, for nitric acid and starch prove in it the presence of an iodide.

MORPHINE.

Morphine, as we have already said, reacts on hyperiodic acid as on iodic acid. Some of the acid is liberated, and a portion of this iodine enters into combination with the alkaloïd to form an iodide.

STRYCHNINE.

Treated directly by hyperiodic acid, or previously dissolved in alcohol, strychnine gives, by the evaporation of the solution in vacuo, voluminous crystals. These crystals have the form of a six-sided prism, terminated by a pyramid with four faces. Heated on a sheet of platinum they decompose without explosion, leaving a slight black trace. Dissolved in water, they give a yellow precipitate with nitrate of silver, and the precipitate is entirely soluble in nitric acid. The solution of hyperiodate of strychnine never becomes red, as is always observed with that of the iodate of the same base.

BRUCINE.

Hyperiodic acid combines with it more readily when it is dissolved in alcohol than when in a pulverulent state. By the evaporation of the solution in a stove at 86° to 104° F., beautiful colorless crystals are obtained, which decompose with a slight noise when they are exposed on a leaf of platinum to the heat of a spirit lamp. There only remain traces of charcoal.

VERATRINE.

The combination of this base with hype-

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riodic acid is effected especially by the intermedium of alcohol, in which it dissolves with great facility. It only requires, to be completely saturated, a small quantity of acid. The liquor, left in contact with hot air, evaporates rapidly, and deposits a matter of a buttery appearance, which quickly becomes harder and resinoïd. There exists, in the midst of this matter, a crowd of crystals which the microscope enables us to see, but of which the form is difficult to characterise. It is easy to ascertain, by means of nitrate of silver, that the hyperiodic acid has not undergone any alteration in these crystals.—*Annales de Chimie et de Physique*, March, 1852.

ON THE PREPARATION OF PURE HYDRATE AND CARBONATE OF POTASSA.

BY HENRY WURTZ, A.M.

In preparing pure potassa compounds, it is highly necessary, especially in order to avoid the possibility of the presence of soda, to select, as a starting point, some compound of potassa which differs considerably in solubility from the corresponding soda compound. Either the bitartrate or the sulphate, therefore, is usually preferred.

The bitartrate is ignited: the carbonaceous mass, washed with water, and the solution of the carbonate of pottassa thus obtained, diluted and boiled with slack lime in the usual way, in an iron kettle; the solution of hydrate of potassa thus obtained is boiled to dryness, and the alcoholic solution of the residue evaporated in silver dishes, to obtain what is denominated *alcoholic potassa*. This product should be, and most usually is, entirely free from sulphate of potassa and chloride of potassium, since it is easy to crystallize the bitartrate free from these salts.

But an almost invariable accompaniment of this alcoholic potassa is a trace of silicate of potassa. The solution may assume no cloudiness on the addition of solution of chlorohydrate of ammonia, or upon addition of an excess of chlorohydric acid, and afterwards an excess of ammonia; but, on adding excess of chlorohydric acid, and evaporation to dryness in a platinum capsule, the aqueous solution of the residue will be found to have flakes of silica floating in it. Very few specimens that I have met with have stood this test. It is to be inferred that the soluble silicates of potassa are not wholly insoluble in alcohol; but a question arises concerning the source from whence the silica is so frequently derived. It may be from the lime used in some cases, or from silicum contained in the iron of the kettles employed. I am enabled to state in addition, that many specimens of commercial *carbonate of potassa* which I have examined, some of which purported to have been prepared from cream of tartar by the method above aluded to, none have been found entirely free from silica. I have even found traces of this impurity in crystals of commercial *bicarbonate of potassa*.

This constant contamination of potassa, and carbonate of potassa with silica, being a very important matter in consideration of the frequent use of these two substances in chemical analysis, I have been induced to devise a means of separating the silica from the carbonate. This I have accomplished by the use of carbonate of ammonia.

An aqueous solution of the carbonate which is to be freed from silica is evaporated to dryness on the sand bath (best in a sheet iron dish), adding from time to time lumps of carbonate of ammonia. The silicate is thus converted into carbonate, and on dissolving the residue of the evaporation in water, the silica appears in the form of flakes floating on the liquid, and may be separated by filtration. This solution of carbonate of potassa, free from silica, may now be used for the preparation of pure hydrate of potassa, taking care to use lime which is also free from silica.

I may here introduce a few words with regard to the preservation of hydrate of potassa for use in analysis. Its preservation in the solid form is evidently no difficult matter; but when we attempt to keep the solution in glass bottles for the sake of convenience in using it as a re-agent, we generally find that it very soon takes up silica from the glass. I have found, however, that flint glass bottles will preserve such a solution much longer than any other, lead glass not being easily acted upon, probably because it contains very much less silica. It might not be useless to make a trial of bottles, made of thin, soft iron, or sheet iron for this purpose; but it is probable that pure *silver* is the true material for bottles, in which solution of potassa is to be preserved. A very thin shell of silver might be first made, and afterwards strengthened by coating it thickly with galvanic copper.

The ease with which sulphate of potassa can be obtained in a state of purity has long ago suggested its use as a material from which to prepare pure potassa. Schubert* proposed to treat pulverized pure sulphate of potassa with a concentrated solution of

* Erd. und Mar. Jour. 26, 117.

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baryta, the latter somewhat in excess, and, during the evaporation of the solution of hydrate of potassa thus obtained, the excess of the baryta is precipitated by the carbonic acid of the air. This, however, appears to be a very expensive process. I have devised another method of treating pure sulphate of potassa so as to obtain pure hydrate of potassa therefrom; it consists merely in operating upon the sulphate of potassa in a manner similar to that in which sulphate of baryta is operated upon to procure hydrate of baryta, that is in converting the sulphate into sulphide by the conjoined application of a reducing agent and a red heat, and to decompose the aqueous solution of the sulphide by the action of an oxide of a metal whose sulphide is insoluble, such as oxide of iron (?), oxide of copper, or deutoxide of manganese. I use as a reducing agent, instead of, charcoal, oil, rosin, etc., *coal gas*. This application of coal gas was proposed by Dr. Wolcott Gibbs. If it is found that the decomposition is not perfect, and that the solution of sulphide of potassium contains some sulphate of potassa, or if a little sulphate is formed in the solution by oxidation, it is removed by the introduction of a little solution of baryta according to the method of Schubert. I am not yet prepared, however, to give details of this method.—*New York Journal of Pharmacy*, February, 1852.

ON THE PREPARATION OF CHEMICALLY PURE HYDRATE AND CARBONATE OF SODA.

BY HENRY WURTZ, A.M.

THE remarks made in the last article with reference to the presence of silica in alcoholic potassa, apply also, though not so generally, to commercial alcoholic soda. Few specimens of this product are met with which are so free from silica that it cannot be detected by saturation with chlorohydric acid, evaporation to dryness in a platinum vessel, and redissolution in water. Whatever may be the origin of the silica in this case, it is very often present.

I have selected, as the most convenient substance from which to prepare pure hydrate and carbonate of soda, a product which occurs very abundantly in commerce under the name of "carbonate of soda." It is in form a very fine white powder, and on examination turns out to be the ordinary monohydrated *bicarbonate* of soda.

$$NaO, 2C.O^2 + H.O.$$

For, upon ignition, 7·756 grns. lost 2·7595 grns. of carbonic acid and water, which is equal to 35.60 per cent.; bicarbonate of soda should lose 36·88 per cent. It may be mentioned, in this connection, that a preparation sent over here by Button, a London Pharmaceutist, under the appellation of "Chemically Pure Carbonate of Soda," upon examination turned out to be also *bicarbonate*. 2·324 grns. lost by ignition; O. 845 grn. = 36.45 per cent.

The commercial bicarbonate above mentioned, contains, of course, all the impurities of the carbonate from whence it is made, this being an inevitable consequence of the method by which it is manufactured, which, as described in Knapp's Chemical Technology, is simply to expose commercial crystals of carbonate of soda to the action of carbonic acid gas, which it takes up to the extent of one equivalent, falling into a fine powder, with evolution of heat and loss of water of crystallization. These impurities, in the case of the specimen operated upon by me, were, besides considerable silicia, sulphate of soda, chloride of sodium, a trace of phosphoric acid detected by monohydrate of ammonia, and a little organic matter, which imparted to the mass a soapy smell.

The sulphate, phosphate, and chloride are easily removed by washing the water by decantation, with a loss however of at least one half of the material. When the washing, after addition of excess of nitric acid, no longer react with nitrate of silver, or with chloride of barium, the mass is introduced into porcelain dishes, and dried on the sand bath; when dry it is exposed to a high sand bath heat though not to a red heat, for two or three hours. By this treatment, not only are one equivalent of carbonic acid and one equivalent of water expelled, but the greater part or the whole of the silicate is decomposed and converted into carbonate, so that a solution of the mass in water will now be found full of flakes of silica.

The filtered solution should now be tested for silica and if not yet entirely free from it, must be evaporated again to dryness, with addition of lumps of carbonate of ammonia, exactly as proposed by me in the last article, to separate silica from carbonate of potassa. The residue of this last evaporation, on solution in water, filtration and evaporation in platinum, silver, or even clean sheet iron (never in glass or porcelain) dishes, will give pure carbonate of soda, from which may be prepared the pure hydrate of soda, observing the precaution of using lime which is free from silica.—*New York Journal of Pharmacy*, February, 1852.

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NEW DEVELOPEMENTS RELATIVE TO THE CHEMICAL EFFECTS PRODUCED BY THE CONTACT OF SOLIDS AND LIQUIDS.

BY M. BECQUEREL.

THE chemical changes produced by more or less solid bodies, with the solutions exercising more or less feeble actions on these bodies, with or without the concurrence of electric forces, have long been the constant subject of my investigations, as much on account of the principles which flow from them as by reason of their application to the natural sciences, to arts and industry. I applied myself, in the first instance, to producing the phenomena by employing electricity, then only by the intervention of affinities; such is the point of view in which I regard electro-chemistry.

The study of slow actions is in general neglected, because it is beyond the habitual circle of the investigations of the chemist, because it sometimes requires a more or less considerable length of time and the concurrence of electricity, hitherto considered as an accessory, subordinate to affinity. It is now impossible to doubt that the electricity disengaged on the contact of solids with liquids has a chemical origin; to deny this truth is to deny evidence, to misconceive the relations which have been turned to account for the production of a mass of chemical effects which would have remained unperceived had not endeavors been made to render them useful.

Electrical forces, although subordinate to affinity, should not be considered merely as simple accessory forces; for, in many instances, and especially in slow actions, they become often causes, and determining causes for the production of new chemical actions, or for giving greater energy to those already commenced. Thus, when two bodies in contact, one solid and the other liquid, react very slowly one on the other, so as to produce inappreciable chemical effects, if the electricity disengaged be secured by a third body suitably disposed, the new energy will be given to the affinities, and these effects then become more and more manifest. The compounds formed will then almost always crystallise, even if insoluble. This electricity, which exists in the latent state between the molecules of bodies, will perhaps some day, when its power is thoroughly rendered available, give as much assistance as steam, and of the same order, to arts and industry.

I have seen many remarkable examples of the intervention of electricity in slow chemical actions, and amongst others I may mention the following experiment: take a flask containing a solution of chloride of sodium marking 3 or 4 degrees of the areometer, then place horizontally on this liquid, a small circular plate of iron, at the centre of which is a spiral wire of copper or platinum; the stem which supports the plate, and which is of copper or platinum, passes into the cork, which imperfectly closes the flask. The plate is put in so far that the solution just covers the upper surface. The electro-chemical effect is quickly manifested by the oxidation of the iron under the combined influence of the air and the water. The soda deposited on the portion of the copper or platinum wire, which touches the liquid, greedy of carbonic acid, ascend the whole length of the spiral, until it is saturated with it; the resulting carbonate of soda crystallises among the circumvolutions of the wire in rhomboïdal prisms. The carbonates of potassa and many earthy oxides may thus be obtained in a crystalline form.

I now pass to another order of phenomena.

EFFECTS RESULTING FROM THE REACTION OF VARIOUS ALKALINE AND METALLIC SOLUTIONS ON LIMESTONE.

$(CaO, CO^2.)$

1. *Formation of neutral phosphate of lime.* $(2CaO, PhO^5, 4HO.)$—By causing a solution of phosphate of ammonia, marking 5 degrees, to react slowly, by the intervention of carbonic acid gas, on a piece of limestone, there will appear by degrees on the surface right rhomboïdal crystals, terminated by angular summits with two sides, and the composition of which is that of neutral phosphate of lime.

This compound is obtained in a state of great purity by operating on carbonate of lime obtained by double decomposition.

II. *Carbonised lead.* (PbO, CO^2).—This compound may be obtained crystallised, similar to that of nature, by causing a solution of nitrate or chloride of lead to react slowly on limestone for several months; the crystals present themselves under the form of eight rhomboïdal prisms, or prisms with six faces, having a regular appearance, or again in prisms with six faces terminated by points.

III. *Bibasic carbonate of copper.* (malachite.) $(CuO^2, CO^2, 2HO)$.—I announced twenty years ago, the process by means of which malachite may be produced; but in this memoir, I develope this process with many more details than before, so as to show all its copiousness.

If a piece of very porous limestone be

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plunged into a solution of nitrate of copper marking 12 to 15 degrees of Baumé's areometer, carbonic acid gas will be disengaged, there will be formed at the same time nitrate of lime which dissolves, and insoluble sub-nitrate of copper, which is deposited on the limestone in acicular crystals of a light green color. The reaction extends gradually from the exterior to the interior, by an effect of imbibition, and does not stop until the sub-nitrate obstructs the molecular interstices so much that the capillary action can no longer exert itself.

If the piece of limestone covered with crystals of sub-nitrate of copper is now plunged into a solution of an alkaline bicarbonate, marking from 5 to 6 degrees of the areometer, these crystals will be perceived gradually to take a green tint, due to the formation of basic carbonate of copper (malachite). A few days suffice for effecting this transformation; if the operation be much prolonged the green color will disappear, in consequence of the formation of a double carbonate of copper and soda of a sky blue color. This new compound crystallises in very small brilliant crystals which adhere firmly to the limestone.

In an experiment commenced eight years ago, with bicarbonate of potassa, I obtained pretty blue crystals of 1 millimetre on each side; these crystals are right rectangular prisms, the ridges of the base of which being truncated, give an incomplete octohedron which still retains a slight portion of this base. This form is the same as that of arseniate of copper.

It sometimes occurs, especially when the solution of the bicarbonate is concentrated, that the reaction of the alkaline bicarbonate does not cause a green product, but a greenish blue product, the nature of which it is difficult to ascertain by reason of its mixture with the bibasic carbonate. The analysis of the different products previously described show that by causing 1 equivalent of bicarbonate of soda, there are produced 2 equivalents of bibasic carbonate and 1 equivalent of nitrate of soda.

In the preceding phenomena a remarkable effect is manifested: the sub-nitrate of copper obtained with the carbonate of lime formed by double decomposition, and the nitrate of copper consists of a pulverulent crystalline matter, the constitution of which does not appear to have changed; thus, in the substitution of 2 equivalents of carbonic acid in the place of 1 equivalent of nitric acid, the first compound crystallised remains the same, during and after the substitution. This mode of double decomposition, which frequently takes place in nature, probably explains to us the mode of formation of certain hitherto unaccountable productions.

The malachite depositing on and adhering to the limestone presents itself under the form of small silky tubercles, as it is often found in nature; it has but little hardness in consequence of its molecular state. Perhaps it would be possible to give it more by acting even more slowly. This compound undergoes no change either in boiling water, nor by exposure to air.

During the transformation of the bibasic carbonate of copper into double carbonate, there are seen to emerge from the interior of the limestone, more or less distinct filaments of carbonate of lime, twisted and terminated with a point as if they had passed through a wire drawer. They are due to the ejection, through the fissures, of threads of a concentrated solution of nitrate of lime produced by the reaction of the nitrate of copper on the limestone. As soon as this solution is in contact with that of the bicarbonate of soda, there is a production of carbonate of lime, and consequently the solidification of the liquid thread.

It is essential to operate with a solution of nitrate of copper, free from sulphate of lime, which would crystallise on the limestone.

The malachite formed as thus described has a tarnished appearance; but to give it the ordinary brilliancy and the tint proper to the malachite, it is necessary, in consequence of its little hardness, to apply upon it a varnish of gum lac, and then to polish it successively with pummice and fullers' earth.

I have the honor to present to the Academy a vase 4 decimetres high, of rough limestone in the neighbourhood of Paris, which is covered with malachite to the thick of half a millimetre. In truth this malachite does not present those beautiful concentric zones which give so much value to this mineral; but it may be possible to obtain them with calcareous alabaster with concentric layers, at least we may be allowed to believe so in consequence of some experiments which have been tried for that purpose.

If, instead of plunging the limestone covered with sub-nitrate of copper, in a solution of bicarbonate of soda to obtain malachite, it is immersed in a dilute solution of potassa, the effects are different; there is a decomposition of the sub-nitrate of copper, a formation of nitrate of soda and a deposition of hydrated deutoxide CuO,HO, in very fine blue crystals, adhering to the limestone and unalterable in the air; these crystals, confusedly grouped on the surface

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of the limestone, have an agreeable effect.

By preparing the deutoxide CuO, HO, with carbonate of lime obtained by precipitation, and causing it to dry *in vacuo*, after preliminary washings in cold water, a powder of a pretty blue will be obtained, unalterable in the air, and which resembles the blue cinders which have been long prepared in England by a secret process.

Analysis having proved to me that this product has the same composition as the oxide CuO, HO, which is obtained by pouring a solution of potassa or soda into another solution containing a salt of deutoxide of copper, we must come to the conclusion that they differ one from the other only by a molecular state, and that the first is more stable than the second.

IV. *Sub-sulphate of copper.* (Brochantite.)—This mineral may be produced with great facility, and with the faces peculiar to the natural specimens, by putting a piece of porous limestone in contact for several months with a saturated solution of sulphate of copper. There are gradually deposited on the surface of the limestone, small crystalline tubercles of a pale green color, and a great number of crystals of sulphate of lime.

The sub-sulphate of copper may likewise be transformed into bibasic carbonate of copper, by putting it in contact with a solution of bicarbonate of soda for a longer or shorter time.

I have succeeded in forming other products by causing limestone to react on other metallic solutions, and which I will make known in a future Memoir.

CHEMICAL EFFECTS PRODUCED IN THE REACTION OF ALKALINE SOLUTIONS ON SULPHATE OF LIME.

(CaO, SO^3).

I. *Arragonite* (CaO, SO^3).—I have shown in a former work that carbonate of lime crystallised in primitive rhombohedra might be obtained by causing a slightly concentrated solution of bicarbonate of soda (2 degrees to the areometer) to react slowly on plates of sulphate of lime (gypsum of Montmartre). By experimenting with a solution marking 5 or 6 degrees, the carbonate of lime crystallises in the rectangular prismatic system,—that is to say that it produces crystals of arragonite. The crystals appear to be formed by the reunion of several others presenting the primitive form with modification.

It is not then surprising that arragonite is found in the gypseous saliferous soils, such as those of Spain the Landes, the Pyrenees, Saltzburg, Sicily, etc., soils in which some of the conditions necessary to its formation may be found.

II. *Carbonate of lime in a crystalline state.* Plates of sulphate of lime steeped for several months in a solution of potassa marking 10 degrees, contained in an imperfectly closed phial, is transformed into carbonate of lime having a crystalline texture. In this transformation there is likewise a substitution of the carbonic acid furnished by the air for the sulphuric acid of the gypsum.—*Comptes Rendus*, No. 16, 19th April, 1852.

ANALYSIS OF A SALINE ASH FROM BRITISH GUIANA.

BY MR. EDMUND GREAVES.

AMONG the interesting specimens exhibited at the late Great Exhibition from British Guiana, and presented to the Pharmaceutical Society, was one labelled Saline Ash, which is said to be used by the Indians as a substitute for salt.

It having been stated at a former Meeting that it would be interesting to know the composition of this substance, I have submitted it to an examination, the result of which I now lay before the Society. The ash in the state in which we have it is in black pulverulent masses. It is said to have been obtained by burning certain plants growing on the rocks near the rapids, about a thousand miles up the river Demerary.

The salt is very easily extracted from the ash by treating it with cold water, and evaporating the solution to dryness. Seventy-five per cent. of soluble saline matter may be thus extracted, the insoluble residue consisting of carbon, silicious matter, carbonate of lime, and insoluble phosphates in the following proportions:—

Carbonaceous matter	31·
Silicious matter	44·2
Carbonate of lime and insoluble phosphates	24·8
	100·0

The salts soluble in water were found to consist of chlorides of potassium and sodium, together with a portion of alkaline carbonate and a small quantity of sulphate. It was tested for iodine, but there was none found. 100 grains of the dry salt gave

Sulphuric acid.....	1·0 grs.
Carbonic acid	4·4
Chlorine	45·548

Now, assuming the sulphuric and carbonic acids to be in combination with potassa, we should have 84 grains of the chlorides of potassium and sodium, and as these contain 45·648 grains of chlorine, we may deduce

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the following composition of the salt by calculation:—

Sulphate of potassa	2·18
Carbonate of potassa.....	13·82
Chloride of potassium	33·6
Chloride of sodium	50·4
	100·00

From the above results, it will be perceived that the peculiarity of this vegetable ash consists in the large amount of chlorides contained in it, which very well adapts it for the purpose to which it is applied, and renders it a tolerably good substitute for that essential substance—common salt.—*Pharmaceutical Journal*, May, 1852.

ON GALVANIC PLATING.

BY MM. E. THOMAS AND V. DELISSE.

THE researches of De Ruolz and Mr. Elkington have proved that all solutions of the salts of silver will not give, with the aid of the battery, constant and adherent deposits of metallic silver; that this property is limited to certain particular solutions, the characters of which may be thus defined: 1st, the liquor must be a sufficiently good conductor of electricity; 2nd, under the influence of the electric current it must be able to deposit only silver; 3rd, the liquor must not attack the metal intended to be covered; 4th, the liquor must have an alkaline reaction. To these four conditions M. Bouilhet has lately added a fifth, which is, according to him, indisputable; it is that the liquor must contain a double salt of silver and a fixed alkali which, by decomposing, give rise to the plating.

Only two series of solutions agree with all these conditions: 1st, the solutions of silver in the alkaline cyanides which alone have hitherto furnished constant and satisfactory results on all these points; 2nd, solutions of silver in the alkaline hyposulphite of soda or of potassa, which give good indications of plating, but which are subject to such variations in the thickness and adherence of the silver deposited, that, notwithstanding their lower price these hyposulphites cannot be substituted for the alkaline cyanides.

The salts with ammoniacal bases, of which several dissolve oxide of silver easily and in great quantity, will not, according to Mr. Elkington, give solutions capable of plating. Nevertheless it is into this series of compounds that we have made our investigation.

In the first place we convinced ourselves that no salt of ammonia, whether neutral or alkaline, holding oxide of silver in solution in water, will deposit metallic silver in a constant and adherent layer; the ammonia coming to the negative destroys the deposition which is beginning to form, and attacks the metal which it is intended to cover.

We had a commencement of success by employing alcohol as a vehicle, by saturating it with nitrate of ammonia to render the bath a conductor, then dissolving in it the double nitrate of silver and ammonia in as neutral a state as possible. But, although this bath gave a thick and adherent plating, it was subject to too many casual obstacles. The too great alkalinity of the liquor, the lowering of the temperature, the presence of the least trace of chloride, will prevent a good result; moreover, the amount of electricity used must be considerable; and the copper intended to receive the deposit of silver requires to be first covered by a particle of the metal to be used in the operation of washing.

We were then led to remark that the plating depended essentially on the reductive power of the bath, and a great number of experiments made us see that although alkalinity might be a necessary character, it was an absolute obstacle when using ammoniacal salts; that the acidity of the bath, so far from being injurious, was indispensable under those circumstances, provided that it was due to an acid greedy of oxygen, and which did not attack copper too powerfully.

We must here mention that we did not endeavor to determine the mode of action of the alkaline cyanides in plating, but merely the conditions in which it would be possible to deposit metallic silver on copper by employing solutions of the salts of ammonia.

A sealed packet, deposited by us at the sitting of the 23rd February, contains a series of experiments made on this subject; but without asking as yet for the opening of it because it contains the beginning of some other investigations which we have not yet finished, we will briefly retrace here our principal experiments.

1. Whatever may be the solution of silver in a salt of ammonia on which we operate, it will only give a constant and adherent deposit of silver when it contains a free acid, greedy of oxygen, such as phosphorous, sulphurous, hypophosphorous and hyposulphurous acids. Thus the neutral or alkaline hyposulphite of ammonia does not furnish good plating; it will give it, however, as soon as it is rendered distinctly acid with an acid greedy of oxygen.

II. All the acids greedy of oxygen do not succeed: this is the case with nitrous acid,

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because, probably, it has too much affinity for the metal intended to be covered.

III. All the solutions of salts of ammonia capable of dissolving oxide of silver will not succeed; moreover it is necessary that the solution of silver should be stable; thus, sulphate of ammonia plates at first, but it soon decomposes rapidly under the action of the pile, and almost the whole of the silver is precipitated. But, if hyposulphate of ammonia be added to the acid sulphate of ammonia, it renders it capable of furnishing a more stable bath of silver, giving the best results.

IV. The presence of a double salt of ammonia and silver is not a sufficient condition for the bath: in fact the neutral solution of double nitrate of ammonia and silver will not plate; it gives marks of successful plating if saturated with sulphruous acid. It is the same with the double sulphate, with the exception of the stability of the bath, and *a fortiori*, it is the same with the double hyposulphate.

V. The presence of a double salt of silver and any alkali whatever is not a condition necessary for bath plating. In fact, the citrate of silver, as mentioned by M. Regnault, prepared by passing hydrogen over citrate of silver—precipitated without heat to avoid the formation of aconitic acid—gives a solution which plates very well, but which decomposes in the light, which renders it impossible to employ it. Nitrate of silver also plates well at first, but the affinity of nitrous acid for copper soon impedes it.

VI. It appears to us that in the baths we have tried the salt of ammonia has no other object than to keep the silver in a state of solution whilst the power of plating is due entirely to the presence of a free acid greedy of oxygen. This acid really has no other effect than that of retaining the ammonia without attacking the copper; for, if we acidify the bath with sulphuric acid, it gives no plating. Nevertheless, we may ascertain, by agitating copper turnings quite free from verdigris with sulphuric acid, that this metal is not sensibly attacked, whereas sulphuric acid, in the same conditions, attacks it powerfully.

VII. In the baths which we have tried a platinum anode gives better results than a silver anode. Indeed, the anode of silver whether in these baths or in those of cyanide, does not dissolve in proportion to the silver deposited on the cathode; it attacks besides a notable proportion of silver from the anode which is precipitated in the state of subsalt. Only in the baths of cyanide, the soluble anode must be used, to avoid the disengagement of hydrocyanic acid, whereas the disengagement of sulphurous or hyposulphurous acid causes no inconvenience.

VIII. The cleaning of the pieces intended for plating should vary according to the reaction of the bath, to obtain adherence: cleaning with acids will cause adherence only in acid baths; it destroys, on the contrary, the adherence in alkaline baths. This may perhaps result from the different molecular state of the copper when cleaned with pummice and potassa from when cleaned in an acid bath.

To sum up, the bath which gave us the best results is a mixture at 8 degrees of acid bisulphate and hyposulphite of ammonia, in which was dissolved oxide of silver or an insoluble salt of this base, chloride for example. Several eminent men, MM. Dumas, Payen, Peligot, E. Becquerel, have already done us the honor of witnessing the experiments, and have appeared to admit their accuracy.

This bath which appears subject to quite different conditions to those hitherto required, has, moreover, an advantage over the cyanide baths which is worthy of notice, insomuch as it is quite inoffensive to the health of those who employ it, a consideration which may perhaps have some value in the eyes of the Academy. Besides, this bath is practically economical, for the salts which compose it are of small value, and, moreover, it is a good conductor of electricity, it requires less of it than in alkaline baths.—*Comptes Rendus*, No. 15, April 12, 1852.

EASY DECOMPOSITION OF AMMONIA. NEW SOURCE OF PURE HYDROGEN FOR THE REDUCTION OF METALLIC OXIDES.

BY M. BOUET BONFILL.

It is generally believed that ammonia requires a heat beyond a red heat for decomposition, and it is even said that the decomposition is never complete. To render this decomposition complete it is necessary to employ a sustained current of electric sparks; heat alone never produces this decomposition, whatever may be the temperature and time employed for obtaining it.

We have, however, proved that ammonia is decomposed easily and completely by fire at a less heat than bright red, by causing it to pass through a porcelain tube filled with quick lime. To assure ourselves that the lime was completely free from water and carbonic acid, we heated it to a bright red

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heat for half an hour; we then raised the dome of our rectangular reverberatory furnace, and we set aside the red charcoal which covered our porcelain tube so as to cool it, and when this tube no longer presented the last discoloration in consequence of the preceding temperature, we passed the dry ammoniacal gas through it, and we obtained immediately a strong current of nitrogen and hydrogen.

If we simply passed the gas through the porcelain tube heated to redness, there was scarcely time for the decomposition to take place, nevertheless some bubbles of hydrogen and nitrogen were collected proceeding from the decomposition of a very small portion of the gas; but the greater part of the ammonia passed through without undergoing any alteration. We observed nearly the same thing when we were satisfied with putting some fragments of porcelain into the tube so as to multiply the points of contact; which was precisely the manner of operating recommended by Scheele, and, after him, by Berthollet.

So as to multiply still further the points of contact, we begin to charge the porcelain tube with little pieces of lime, then with a coarse powder, and finally with fine powder; and, to give a clean passage to any gases which might be formed, we gave some light blows to the tube in an horizontal position as is done in the elementary analyses of organic substances. It was in this manner that we proved the decomposition of ammoniacal gas in the different operations which we are about to quote.

From this easy decomposition by fire, it results that we can procure hydrogen applicable for all the same purposes as when chemically pure, whenever the presence of nitrogen is not an obstacle. And, in the first place, we have found an application for this hydrogen in the reduction of the metallic oxides by M. Rivot's method, the presence of nitrogen not being any inconvenience in this reduction. The hydrogen obtained by the ordinary means always contains, in fact, some foreign gases proceeding from the presence of arsenic, antimony, and sulphur in the zinc employed, without reckoning the extremely volatile liquid carburetted hydrogen which is likewise produced, and the separation of which is not so easy as that of the hydrogenous combinations of the first three bodies. From whence it results that the metal reduced by M. Rivot's method must always contain a more or less considerable quantity of a carburet of which it would be necessary to calculate the carbon, and deduct it from the weight obtained, or run the risk of giving as the result of the analysis a greater richness in metal than really exists.—*Comptes Rendus*, No. 16, April 19th, 1852.

BIOGRAPHY OF VAN HELMONT.

BY M. CAP.

With the name of Van Helmont, as with that of Paracelsus, is generally connected the idea of the last efforts of alchemy, of theosophism, of the occult sciences, which were about to disappear before a more rational order of ideas, which the succeeding age applied itself to pursue and develope. It is, however, erroneous to unite under the same point of view these two personages, whom very decided oppositions distinguish, and should prevent us from confounding. Van Helmont is often regarded as the successor, the immediate follower of Paracelsus, whereas he merely derived from the latter a few vague systematic views, whereas a century elapsed between their existence, and whereas the differences which appear between them refer at once to their works and to their theories, to their knowledge and to their personal character.

John Baptist Van Helmont, of the illustrious family of Merode, was born at Brussels, in 1577. His mother, of a noble family of the same country, was called Margaret of Stassart.* Having lost his father early,

* I owe to the kindness of a learned and worthy member of this latter family some biographical details, which I am glad to have obtained. J. B. Van Helmont, who possessed the title of Lord of Royeuborch, Merode, Oorschot, Pelliues, &c., married Marguerite Van Ranst, who proved one of the most devoted of wives. He had several children by her, most of whom died in youth. One of his sons, Francis Mercury, baron Van Helmont, was the editor of his father's works, and himself wrote some very strange works, among others, one on language, in which he applied hinself to seeking the elements of primitive language, and in which is found the germ of the method followed by the abbé de l'Epée. One of his daughters, Countess of Meghen, was canoness of Sainte Gertrude, at Nivelles. Among the eight quarters of paternal nobility which she had to produce, figured the names of Van Helmont, of Stassart, of Renialme, of Van Rnast, of Vilain, and of Merode. Those are the arms of these ancestors which are seen with the portraits of J. B. and Francis Mercury, at the head of the three editions of Van Helmont, published by his son, at Amsterdam.

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he was sent to the College of Louvain. One of its Professors, Martin del Rio, who had published a work on sorcery, initiated him in the doctrines of the cabal, still very commonly studied at that period, and disposed his mind to mystic ideas: these mystic impressions exerted an influence on him throughout his life. Van Helmont early showed a remarkable aptitude for the cultivation of the sciences: caring little for the honors and employments appertaining to his rank of life, he resolved, notwithstanding some opposition on the part of his family, to give himself up to the study of medicine. He made such rapid progress that he had scarcely left the benches of the school, when the chair of surgery in the University was confided to him, from which, as he himself owned, he taught that which he did not yet know. In order to render an exact account of the scientific doctrines of antiquity he applied himself to the acquisition of the ancient languages, and was very soon enabled to read, in the original text, the writings of the fathers of science; but far from thus acquiring an admiration of their works, he seems only to have found arms wherewith to combat their theories. He had no greater regard for their philosophical doctrines, especially when he found them modified and turned from their true direction, in the schools of the middle ages. More accessible to the ideas of the modern theosophists, he gave himself up to them without reserve, and henceforward turned all his studies in this direction. He abandoned, even at this period, the medical sciences, and directing all his researches to natural philosophy, he applied himself to make, not only all the facts which came to his knowledge, but all the suppositions which he imagined in the midst of reveries and the most fantastic extacies, agree with his convictions.

He afterwards travelled, and after having devoted several years to visiting foreign universities, he returned to his own country. At this period, an accidental circumstance gave a new direction to his ideas. Being attacked with a very obstinate cutaneous disease, he had recourse at first to the therapeutics of the time, which attributed his malady to the combustion of the bile and the saline state of the phlegm. Consequently, the ordinary means were employed,—the obligatory arsenal of the humorists, especially purgatives—which weakened, without benefitting him. He then revolted against the doctrines and practice of the school, and applied to an empiric, who prescribed the use of sulphur and mercury, and he was cured. Struck with this result, Van Helmont resumed the study of medicine, and became one of the most fervent adepts of the chemiatric school. He gave up to his family the greater part of his fortune, and retired to an estate, which he retained to himself, at Vilvorde, married and never left his retreat, where he devoted himself for more than thirty years to his researches, his learned and philosophical meditations, and the practice of the most noble virtues.

He suffered towards the close of his life severe tribulations. Some of his opinions became the subject of ecclesiastical censure; he was more than once attacked by physicians, his brethren; finally, he lost successively his wife and four of his children. His health being impaired by age and chagrin, he died in 1644, at the age of 67, two years after the death of Galileo, and the birth of Newton.

The history of science, especially for some years, is much occupied with Van Helmont.* It is, indeed, a spectacle of the highest interest to behold the efforts of this man of genius, applying himself to disengage science from the preconceived ideas which governed it and which governed him; seeking to raise himself by meditation and by experiments to primordial causes, to the very purpose of the Creator, and, from the midst of a thousand more or less strange conceptions, throwing out scintillations of light which henceforward illumined the progress of science, or profound views which served to enlarge its vast field. It is very difficult however to discover, in the midst of his very various and sometimes very obscure writings, the chain of ideas which constitutes his system. Van Helmont himself has not united the pieces in a strictly consecutive manner; his views have not a

* According to Cabanis, G. Cuvier, Gmelin, and Dr. Hoefer, who have discovered in his writings views which had escaped more than one biographer, the memory of the chemist of Vilvorde owes much to the studies which M. Chevreul has lately published in the *Journal des Savants* (February and March, 1850). We should also mention among those who have explored this interesting subject, Dr. Marinus, (*Bulletin de l'Académie de Médecine de Bruxelles*, t. x.; Dr. Michéa, *Gazette Médicale*, 1846); M. Bordes Pagé's (*Revue Independante*, July, 1847); Dr. Guislain (*La Nature considèrée comme force instinctive des organes, Gand*, 1844), and M. Melsens, who made Van Helmont the subject of an excellent lecture at the *'Ecole de Médecine Véterinaire et d'Agriculture, de Bruxelles*, in 1848.

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very determined aim, at least if we except the religious idea, to which he makes all his works subservient. His scientific works relate to chemistry, metaphysics, physiology, and medicine; it is consequently under these principal heads that we must range the facts and theories given in his works. The theosophical idea pervades, as we have said, the whole of his system. After having victoriously combatted the *à priori* doctrines of antiquity, perhaps it may be believed that he substituted a more rational method; and that if he condemns the spiritualist ideas of the school, doubtless he could replace them with others founded on more certain bases. It is not so. It is still the *à priori* method and spiriiualist ideas which preoccupy him; only he endeavors to make them agree with Genesis, and with the holy books, and unites in them strange suppositions, but frequently as ingenious as bold, drawn from his fertile imagination.

Nature, according to him, created by the word of God, comprises:—1. Bodies or matter; 2, Incidental circumstances, that is to say, properties, powers and qualities; 3, The principle of motion. He then divides sublunary things into elements and seminal productions; metals, vegetables, animals, to which must be joined the souls, forms and celestial bodies. His elements are not those of Empedocles or Aristotle, nor even those of Basil Valentine and his school. He admitted only two—air and water; yet air is not in his opinion a material element, but a dry fluid, compressible and dilatable, and, consequently possessing pores and interstices. He admits the existence of a substance, the *magnale*, another fluid intermediate between the air and the celestial bodies, between matter and spirit, which communicates to terrestrial things the influence of the stars, which dilates or condenses the atmospheric air, and, consequently occupies its pores. He explains the extinction of bodies burning in a limited volume of air, as well as the alteration of the air in mines, by saying that its smoke, the metallic emanations or the sylvester spirit fill up its pores and impede the action of the magnale. It is evident that he was still very far from the true theory, which Juan del Rey soon after discovered, although it must have still remained misconceived or ignored.

Van Helmont did not regard the earth as an element, for he thought, with Thales, that it could be reduced into water, naturally or by artificial means. It contains ferments which become the germs of the bodies which are developed in it. Water, in his opinion, represents the sole and universal element. He compares its part in the whole of nature to that of blood in the human body: water is incompressible and inert; it forms the matter of all bodies, and it constitutes them by changing its form under the influence of the archee or seminal spirit. He obtains it from the distillation of all organised bodies, from the combustion of oils, from spirit of wine, and from the most perfectly dried inflammable bodies. Its vapor may also be changed in form by being combined with other bodies, but it cannot be converted into air. However the vapor disengaged from cold water differs from that produced by hot water, and approaches nearer to the nature of gases; it is this which gives rise to meteors.

Van Helmont derived all his ideas concerning the universality of water as a material principle from a celebrated experiment which furnished him, it is true, with erroneous consequences, but which bequeathed to science principles as true as fruitful in applications. He planted a branch of willow of a given weight (5 pounds) in a vessel containing a given weight of well-dried earth (200 pounds). He allowed this willow to grow for five years, confining his treatment of it to watering it with rain or distilled water. At the end of that time the willow had considerably increased; it weighed 169 pounds and 3 ounces, and the earth when again dried had lost only 2 ounces in weight. Von Helmont considered from this that water alone had sufficed for giving rise to 164 pounds of wood, bark, and roots of willow, exclusive of the organs which had been developed and had perished each year. This conclusion evidently was false, for he had taken no account of the salts contained in the earth, nor of the elements which the atmosphere had furnished to the plant, but the experiment had not the less a high scientific bearing, for it introduced for the first time the employment of the balance in observations of this nature, as Sanctorius, at about the same time had applied it to the researches of animal physiology.

Another important experiment, likewise due to Von Helmont, was also very famous and became the origin of a quite new branch of chemical researches. After having operated the combustion of 62 pounds of oak charcoal, the learned experimentalist obtained only one pound of ash, whence he concluded that 61 pounds of charcoal had been converted into sylvester (wild) spirit; he thus designated a kind of air which could neither be retained in vessels nor coerced by compression or cooling. This

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was evidently carbonic acid, which he knew how to distinguish from atmospheric air and steam. He afterwards found this sylvester spirit in the aëriform product of fermentation, in the unrespirable air of mines and caverns, in that which is disengaged from several mineral waters, as well as in calcareous substances when acted on by acids. He noticed its property of extinguishing bodies in combustion and its unrespirability. From this period his genius was turned towards the study of these invisible bodies which are produced in various natural or artificial circumstances. He observed others, produced by the combustion of sulphur, by the action of aqua fortis on a metal, by the distillation of urine, and he imposed on all these bodies a generic name, that of gas, (which he sometimes substituted by that of *flatus*, and which remains in science. Such is the first starting point of the researches relative to this new class of bodies, which have since performed in modern chemistry one of the most vast and important parts.

The word gas is derived from the German word *gahst* or *géist*, which signifies spirit. In the middle age the name of spirit was given to all volatile bodies which resulted from a phenomenon of motion, as fermentation, effervescence and expulsion. These spirits had often terrified the alchemists of preceding centuries, who represented them as furious demons revolting against their sacrilegious researches. According to Von Helmont, the word spirit was limited in its acceptation, and since the time of Boerhaave, it has been applied only to alcoholic or aromatic liquids.

Van Helmont thus defines the word gas, "I call by this name a spirit hitherto unknown, which cannot be retained in vessels nor be shown in a visible form."* He remarks that there exist different kinds of it; that some extinguish bodies in ignition, while others render them more brilliant and inflame them; he proves that, in certain conditions, solid and liquid matters may assume the aëriform state, finally that gases constitute a class of peculiar bodies which differ from each other in their properties.* He noticed the redness of the gas (nitrous gas) disengaged when aqua fortis acts on silver; he remarked that saltpetre subjected to a strong heat gave a gas, which he called fire gas. Unfortunately he was not enabled to collect them and study them separately; still, he characterised them with much sagacity; he designated them by the epithets *pingue*, *siccum* and *fuliginosum*; he called the smoke which escaped from an extinguished candle *corpus gas*. He first gave the just and intelligent definition of flame, saying that it is *a gas which is burning*. He says, that the sylvester gas, which he does not confound with spirit of wine, being compressed with force in barrels renders wines sparkling and frothy. It is by the emission of gases that he connects the explosions of the laboratory with that of gunpowder. Was there not a certain power of mind in choosing as the subject of his researches invisible and impalpable bodies, a subject concerning which such terrible prejudices had so long prevailed? His works, indeed, several times endangered his life, not because he was a bad operator, as has been said, but because he was the first who operated on a class of bodies difficult to manage and naturally explosive. Van Helmont was the true creator of a subject of study which connects him with the most elevated ideas of modern chemistry; it is therefore just to give him the glory of the first idea, as well as to do honor to his courage and his devotion to science.

* *Hunc spiritum* (sylvestre) *incognitum hactenus, novo nomine gas voco qui nec vasis cogi, nec in corpus visibile reduci potest. Ortus medicinæ*, Lugd., 1656, p. 68).

* He observed, besides, that those which escape from the intestines differ from those of the tympanitis: *differunt itaque flatus in nobis, materia, forma, loco, fermento, proprietatibus. (Ortus medicinæ).*

† *Gas, si multa vi intra cados coerceatur, vina furiosa reddit.* (*Ortus medicinæ*).

(*To be continued.*)

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II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

THE ALLEGED ADULTERATION OF PALE ALE WITH STRYCHNINE,

Brewery, Burton-on-Trent.
April 27, 1852.

Sir,

The question of the adulteration of "Pale Ale, or Bitter Beer" by a deadly poison called Strychnine having lately occasioned some anxiety in the public mind, I take the liberty to forward you a copy of a joint Report made by Professor Graham, of University College, and Dr. Hofmann, Professer of the Royal College of Chemistry, on the subject; from which it appears that the scandal propagated was not only utterly unfounded and untrue, but impossible.

Permit me to direct your attention to two points; first, that M. Payen made a very different assertion to that imputed to him in respect to the large manufacture of strychnine, and its importation at present into this country; and, secondly, that so far from the test for detecting its presence being difficult, if not impossible, the means for such detection are at once ready and unfailing.

I have the honor to be, Sir,
Your most obedient Servant,
John Watt, Esq. HENRY ALLSOPP.

We have much pleasure in giving publicity to the following:

REPORT UPON THE ALLEGED ADULTERATION OF PALE ALES BY STRYCHNINE, BY PROFESSORS GRAHAM AND HOFMANN.

London, April 26th, 1852.

Having undertaken at the request of Mr. Allsopp an inquiry into the purity of bitter beer, with particular reference to its alleged adulteration by strychnine, we now submit the results which we have obtained upon the subject.

Strychnine, or strychnia, the alleged substitute for the hop, is a fine crystallisable substance, extracted from *nux vomica*, and belonging to the class of vegetable principles termed alkaloids, of which quinine from Peruvian bark, and morphine from opium, are the most familiar examples. These substances, although susceptible of the most valuable medical application in small doses, are, generally speaking, remarkable for their energy as poisons, and for the intense bitterness of their taste; two properties which are developed in strychnine in the highest degree. Half a grain of the latter substance would poison, and the bitterness of the same minute quantity is perceptible in every drop of six or eight gallons of water in which it is dissolved.

It may be stated at once that the quantity of strychnine which we find necessary to impart to beer the degree of bitterness possessed by pale ales, is for a gallon of beer one grain of strychnine, or double the fatal dose. The price of strychnine is about 16s. the ounce, which does not amount to so much as one penny per grain. Estimating the annual production of pale ale in Burton as 200,000 barrels, the strychnine required as a bitter would, however, amount to 16,448 ounces, and cost £13,158; while nobody believes that so much as 1,000 ounces of strychnine are manufactured over the whole world. The bitterness obtained by means of strychnine is equal in degree to that of the hop, but very different in kind, and easily distinguished when the two bitters are compared. The bitter of the hop is immediate in its action upon the palate, is accompanied by a fragrent aroma, and soon passes off; whilst that of strychnine is not so instantaneous; but when the impression is once made it is more lasting, and becomes, from its persistence, like that of a metallic salt. The bitter of strychnine is, indeed, easily distinguishable from that of the hop, when deliberately tasted.

Still it would be highlydesirable to be able to identify strychnine in beer by the actual extraction of the substance, and the application to it of a chemical test of absolute certainty. Fortunately those poisons which have the most violent action upon the animal economy possess often also the best marked reactions, or their physiological and chemical properties are equally salient. Thus arsenic and hydrocyanic acid are the most easily detected of chemical substances, and strychnine proves to be not far behind them in this respect.

A quantity of strychnine, not exceeding $\frac{1}{1000}$ of a grain, is tested and recognised to be strychnine in the following manner. The powder is moistened with a single drop of undiluted sulphuric acid, and a small

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fragment of chromate of potassa placed in the liquid. A beautiful and most intense violet tint immediately appears at the points of contact, and is speedily diffused over the whole liquid. Although most intense, the color disappears entirely again in a few minutes. The admixture of the smallest quantity of organic matter, however, interferes with the success of the process. In order to apply the test, in operating upon a complex liquid like beer, the strychnine must be first extracted from the liquid and obtained in a pure or nearly pure condition. This difficulty, which appears at first considerable, may be readily surmounted, and the strychnine, if it really exist in beer, be separated, and its nature established in the most certain manner.

For this purpose, two ounces of ivory-black, or animal charcoal were shaken in half a gallon of beer to which ½ grain of strychnine had been purposely added. After standing over night, the liquid was found to be nearly deprived of all bitterness; the strychnine being absorbed by the charcoal. The liquid was now passed through a paper filter, upon which the charcoal containing the strychnine was collected and drained.

The next step was to separate the strychnine from the charcoal. This was readily effected by boiling the mixture for half an hour in eight ounces of ordinary spirits of wine, avoiding loss of alcohol by evaporation. The spirits which now contained the strychnine were next filtered, and afterwards submitted to distillation. A watery fluid remained behind, holding the strychnine in solution, but not sufficiently pure for the test. The final purification was accomplished by adding a few drops of potassa to the watery fluid, and then shaking it with an ounce of ether. A portion of the ethereal solution evaporated upon a watch-glass, left a whitish solid mass of intense bitterness, and this was recognised to be strychnine, by giving the violet tint previously described, upon the application to it of sulphuric acid and chromate of potassa.

Having satisfied ourselves by repeated experiments with samples of beer to which strychnine had been previously added, of the never-failing efficiency of the above method of extraction, we now proceeded to the actual examination of the commercial article. With this object, a series of samples were taken indiscriminately from the stores of a considerable number of the London bottlers who supply the public with Allsopp's pale ale. We mention the beer of the following firms, whose goods were severally examined by the processes which we have above described, and from whom we have documents in hand proving the origin of the beer, and the date of its arrival at their stores from Messrs. Allsopp's brewery.

*C. Barron and Co., 19, Pall Mall.
Barker and Blewitt, 211, Sloane Street.
G. and M. Blockey, Duke Street, St. James's
John Blockey, 104, Ebury Street, Pimlico
*C. H. Bowen, 101, Fenchurch Street.
*R. B. Byass, Langbourne Chambers, Fenchurch Street.
Child and Co., Leicester Square.
L. Clow, Princes Street, Fitzroy Square.
Crimp and Ward, Old Broad Street.
Daukes and Rodick, Exeter Hall Vaults, Strand.
Nath. Eastey, 138, Upper Thames Street.
*Findlater, Mackie and Co., 1, Upper Wellington Street, Covent Garden.
M. B. Foster and Son, 56, Brook Street, Bond Street.
Friend and Co., Abchurch Lane.
George Jones, 8, Billiter Street.
E. and G. Hibbert, 7, Jewry Gardens, Aldgate.
W. J. Hollebone, 1 Lower Eaton Street.
W. Mabey, Lloyd's Coffee House, Royal Exchange.
J. Macdonald, 9½, Queenhithe, Upper Thames Street.
*Moline, Harper, and Moline, London Bridge.
Nisbet, 11, Jermyn Street.
Padget and Son, Pantechnicon.
Rose, Brothers, 257, Oxford Street.
A. Suter, 65, Fenchurch Street.
J. Wallis and Co., Millbank Street, Westminster.
White and Price, Mark Lane.

It may be stated, that with the exception of the five varieties marked with an asterisk, the casks from which these samples were taken had all been received in London before the 20th March, *i. e.*, the period when the possible use of strychnine in the manufacture of bitter beer was first brought before the English public.

Not one of these varieties of beer, when tested with the greatest scrupulousness, gave the slightest evidence of the presence of strychnine.

The charge of adulteration of beer by strychnine has been proposed in a manner so vague, that it is difficult to fix it, and try its validity, The existence of the adulteration is not alleged in any particular sample of beer, nor the practice ascribed to any individual brewer or dealer. An English journalist adopts the charge, upon the report that such an opinion is entertained and expressed by a French chemist of distinction, M. Payen, in his public lectures at Paris. From this gentlemen we have

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since obtained explanations which define more closely the kind of charge which was actually made by him. The late M. Pelletier, the well-known manufacturer of organic products in France, had received at one time an order for an extraordinary quantity of strychnine, of which the destination was at first unknown to him; but which he afterwards learned had been entirely exported to England, and used, as he informed M. Payen, to complete the bitter of certain kinds of beer.

We have reason to know, although it is not stated by M. Payen, that these remarks of Pelletier refer to a period ten or twelve years past; and further, although not informed of the amount of the order, we have good authority to state that fifty or a hundred ounces would have been considered a large order for strychnine at that time. The calculation already given, shows how utterly insignificant such a supply of strichnine would be for its imagined application in the pale ale breweries. It is likewise known that the manufacture of strychnine has not been on the increase in France of late years.

M. Payen excuses his statements on the ground that similar suspicions are conveyed in a French work, on "Adulterations and Falsifications," by Chevallier, published nearly a year ago, but which have not hitherto received any formal contradiction in England. Notwithstanding the latter circumstance, our distinguished correspondent concludes by expressing his regret that he ever said "that the fraud appeared to have been practised," although he had added the remark at the time, "that this falsification had no doubt ceased."

It thus appears, that the charge which has been put into the mouth of M. Payen, was never made at all by that gentleman, so far as it applies to the present practice of English brewers, and with reference to anterior times, that the charge reposes simply and exclusively upon the privately expressed opinion of a deceased chemist, the grounds of which are entirely unknown to the world, and must ever remain so.

In conclusion, it is scarcely necessary to refer to the sifting nature of the chemical examination which the beers of Messrs. Allsopp's manufacture for many months past, have been subjected to, and which establish their uncontestible purity. Indeed, no one who had witnessed, as we have done, the open manner and gigantic scale in which the operations are conducted in their establishment, could entertain the idea for a moment that any practice involving concealment was possible. But even in the absence of all such scrutiny, the idea of strychnine being mixed with beer anywhere, or in any circumstances, involves an amount of improbability which might well dispel all suspicion on the subject.

There is an act of Henry VII. which prohibits the *adulteration* of ale by brimstone or *hops*. The place of the hop was then supplied by sage, horehound, chamomile, and other indigenous bitter plants. Since that period the character of the national beverage must have undergone a silent revolution, for all varieties of beer, both pale and brown, now owe their distinctive properties to the hops, which are boiled in the malt-infusion, and fermented along with it, as completely as wine owes its peculiar character to the grape. Substitute any other bitter for the hop, and the fermented wort would no longer be recognised as beer.

Were mere bitters all that is required, it would be easy to prove that the extract of quassia would supply a bitter which is perfectly harmless and agreeable, and infinitely less expensive than strychnine.

But the process of brewing pale ale is one in which nothing but water, the best malt, and hops of the first quality are used, and is an operation of the greatest delicacy and care, which would be entirely ruined by any tampering with the materials employed. Strychnine could not fail to be rejected, from the ungrateful, metallic character of its bitterness, independent of all objections of a more serious kind. This peculiarity of taste is also calculated to betray its presence. Small, too, as the proportion of strychnine may be, which is necessary to impart the degree of bitterness of pale ale, the quantity rises, as has been seen, to a poisonous dose in half a gallon of the fluid; and as this poison is one of those which are known to accumulate in the system, its poisonous action would inevitably follow, in occasional cases, upon the consumption of much smaller portions of beer when continued for many days without intermission. The violent tetanic symptoms of poisoning by strichnine are also such as could scarcely fail to excite suspicion and alarm. Add to these disadvantages the certainty of the means of detecting strychnine in beer by the chemical tests described above, which any medical man or practical chemist can apply, and the chance of the use of so dangerous a substance for any purpose of adulteration, becomes in the last degree improbable.

(Signed)
THOMAS GRAHAM, F.R.S.,
A. W. HOFMANN, PH.D., F.R.S.,

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ON THE SULPHURATION OF CAOUTCHOUC AND ON SOME PROPERTIES OF SULPHUR.

BY M. PAYEN.

NEITHER essence of turpentine nor benzine bring to the outside the crystalline particles of sulphur carried into the thickness of the swelled-up substance.

This peculiarity appears to me to be due to the more energetic solvent power, which has not hitherto been noticed, I think, of the essence and benzine; in order to verify the fact, I saturated, at the uniform temperature of 176° F., on a sand-bath, both these liquors, by means of an excess of flowers of sulphur; the solutions were effected, coloring the solvents yellow; on being immediately filtered, they deposited crystals on cooling:

	In Essence.	In Benzine.
The solutions contained, of sulphur, while hot	0·0587	0·0733
They retained, after cooling	0·0835	0·0173

The crystals, moreover, were dissimilar: in the essence, slow cooling and evaporation at 77° F., deposited the sulphur in small octohedra, and sudden cooling precipitated prismatic needles; in benzine, the crystals were prismatic. The phenomenon of this latter crystallisation is curious to observe in a glass tube; a number of diaphanous, rectangular lamellæ are seen to form, rise and descend rapidly in the liquid, and agglomerate gradually at the bottom of the vessel, in plates which thus become longer by degrees. After cooling at about 60° F., if evaporation is allowed to commence, a new crystallisation is manifested: it consists of diaphanous octohedra implanted at the end of the opaque and yellowish lamellar prisms formed in the first instance.

By evaporating with heat, long, silky plates are obtained.

A drop of the same solution in benzine, placed on the object-holder of the microscope, deposits, in evaporating, transparent octohedra.

100 of sulphuret of carbon dissolve with heat	78·46
100 of sulphuret of carbon dissolve without heat, or at about 60° F.	38.70
100 of ether dissolve with heat	0·54
100 of ether dissolve without heat	0·188

By cooling, sulphur crystallises in bulky octohedra in sulphuret of carbon; in ether, the crystallisation gives small octohedra and some prisms.

Ether and sulphuret of carbon, kept for a long time in contact with volcanised caoutchouc, retain in solution 4 or 5 hundredths of caoutchouc, which may be isolated by evaporating several times and redissolving in ether which eliminates the free sulphur, and then by alcohol, which removes from 1 to 1·50 per cent. of fatty matter.

The caoutchouc thus extracted may be separated into two parts; one, very ductile, dissolved by benzine, which deposits it in evaporating; the other, more tenacious and less extensible, is not dissolved. These two parts come from the interior of the plates, at a certain depth where the combination is less intimate and less abundant in sulphur than near the surface.

The want of homogeneïty in the combination of the sulphur with the organic substance is more evident in two other methods of volcanisation which I describe further on.

After volcanisation, caoutchouc is also formed of two parts endowed with unequal cohesion and solubility; this is recognised by keeping a strip steeped for two months in a mixture of 10 parts of sulphuret of carbon and 1 part of anhydrous alcohol. The portion dissolved consists of interposed sulphur, which is removed, after dessication by a solution of caustic soda; there then remains the least aggregated and least resistant organic substance, which is yellowish and translucid. The undissolved portion remains under the form of a tenacious strip, which has become brown and less transparent. The following are the proportions obtained, besides the fatty matter:—

Tenacious insoluble portion	65
Soft soluble portion	25
Sulphur in excess	10
	100

Volcanised objects, applied on metals, especially on silver, gold, copper, lead and iron, act by their interposed sulphur, they more or less promptly sulphurise metallic surfaces put in contact with them among these objects, the rundles placed between tubes transmitting steam at four or five atmospheres, exposed, consequently, to from 293 to 310° Fahrenheit, very soon lose their elasticity, become hard and brittle, owing to the combination which is propagated between the free sulphur and the caoutchouc which contains it in its pores. This inconvenience is obviated, in great measure, by desulphuration by means of caustic alkaline solutions, or by the employment of a new method of volcanisation described at the end of this memoir.

Comparative experiments with caoutchouc in the normal, the volcanised, and the

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desulphurised state, show that, in the same circumstances of immersion, during two months, the absorption of pure water was from 0·200 to 0·260 for the first, 0·042 for the second, and 0·064 for the third.

Balloons, 2 millimetres in thickness, filled with water, and subjected to a pressure which doubled their diameter, lost, by continual transpiration, in twenty-four hours, and by square measure: normal caoutchouc 23 grammes, and volcanised caoutchouc 4 grammes.

Similar balloons, filled with air, under the same pressure, had not appreciably diminished in weight after eight days.

It is easy to understand the perceptible loss of water through a thin sheet of caoutchouc, the liquid introducing itself by capillary force into the pores of the organic substance and replacing, continually, the quantities which are evaporated at the external surface.

It may also be easily conceived that air and gases in general cannot exert similar actions.

The process of volcanisation in the cold way, due to Mr. Parkes, consists in immersing the sheets or tubes of caoutchouc in a mixture of 100 parts of sulphuret of carbon and 2·5 of protochloride of sulphur; the liquid, in penetrating into the organic substance, swells it and deposits the sulphur which combines with the caoutchouc, abandoning the unstable combination which it formed in the chloride.

The superficial portions would be too strongly volcanised and would become brittle if these objects were not removed in one or two minutes, and immediately immersed in water, as recommended by M. Gérard.

In this case, the chloride of sulphur decomposed by its contact with the water ceases to act on the surface whilst the portions which have entered further in continue their sulphurising action on the interior.

This, as is evident, is an ingenious means of regulating this kind of volcanisation by the cold way.

A process which seems still more preferable, as regards the healthiness and regularity of the operation, is due to the same inventor. It is effected by keeping the objects to be volcanised immersed for two or three hours in close vessels, in a solution of 25° Baumé, of polysulphuret of potassium, at the temperature of 284° F., and submitting to a washing in an alkaline solution, and then in pure water. We are thus enabled to combine caoutchouc with a useful proportion of sulphur, without allowing an excess of it to be interposed in its pores, thus avoiding the inconveniences of the unequal sulphurisation of the organic substance.

M. Dumas stated that M. Deville had communicated to him results relative to the crystallisation of sulphur, which coincide with those just made known by M. Payen. *Comptes Rendus*, No. 13, March 29, 1852.

PRESERVED MEATS AND MEAT BISCUIT.

BY PROFESSOR LINDLEY.

PRESERVED meats are out of favor just now. We hear of little except condemned canisters, which the Admiralty unfortunately have in store. It is the more proper, then, to state, that the evidence before the Jury (Great Exhibition) went to show that it is possible to preserve meat in canisters without undergoing any change, for a great length of time. We had hashed beef, which was excellent, dated back to 1836; we had boiled beef fifteen years old, preserved in canisters, and many other specimens, none of which were changed. It is clear, therefore, that the canister process of preserving is good, provided you keep a sharp eye on the contractors, and upon those who act under them.

But what is more important than all other preserved provisions, is the meat biscuit introduced among the American exhibitions, from Texas, by Mr. Gail Borden. We were told that its nutritive properties were of a very high order; it was said that ten pounds weight of it would be sufficient for the subsistence of an active man for thirty days—that it had been used in the American Navy and had been found to sustain the strength of the men to whom it had been given in a remarkable degree. Statements were made to us, which have since been corroborated, that it would keep perfectly well, without change, under disadvantageous circumstances. Colonel Sumner, an officer in the United States Dragoons, who had seen it used during field operations, says he is sure he could live upon it for months, and retain his health and strength. The inventor, he says, names five ounces a day as the quantity for the support of a man: but he (Col. Sumner) could not use more than four ounces, made into soup, with nothing whatever added to it. The substance of these statements may be said to amount to this, that Borden's meat-biscuit is a material not liable to undergo change, is very light, very portable, and extremely nutritious. A specimen, placed in the hands of Dr. Playfair for examination, was reported by him to

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contain 32 per cent. of flesh-forming principles; for it is a composition of meat—the essence of meat, and the finest kind of flour. Dr. Playfair stated that the starch was unchanged, that, consequently, there could have been no putresence in the meat employed in its preparation, and that the biscuit was "in all respects excellent." It was tasted; I tasted it—the Jury and others tasted it, and we all found nothing in it which the most fastidious person could complain of; it required salt or some other condiment, as all these preparations do, to make them savoury. The meat-biscuit, as I said just now, was reported to be capable of keeping well—and this might well be true—because no foreign matter had been introduced into its composition; there was no salt to absorb moisture, and nothing else to interfere with the property of flour, or of essence of meat. These biscuits are prepared by boiling down the best fresh beef that can be procured in Texas, and mixing it in certain proportions with the finest flour that can be there obtained; it is stated that the essence of five pounds of good meat is estimated to be contained in one pound of biscuit. That it is a material of the highest value there can be no doubt; to what extent its value may go, nothing but time can decide; but I think I am justified in looking upon it as one of the most important substances which this Exhibition has brought to our knowledge. When we consider that by this method, in such places as Buenos Ayres, animals which are there of little or no value, instead of being destroyed, as they often are, for their bones, may be boiled down, and mixed with the flour which all such countries produce, and so converted into a substance of such durability that it may be preserved with the greatest ease, and sent to distant countries, it seems as if a new means of subsistence was actually offered to us. Take the Argentine Republic,—take Australia, and consider what they do with their meat there in times of drought when they cannot get rid of it whilst it is fresh—they may boil it down, and mix the essence with flour (and we know they have the finest in the world), and so prepare a substance that can be preserved for times when food is not so plentiful, or sent to countries where it is always more difficult to procure food. Is not this a very great gain?—*Lecture before the Society of Arts.*

ON DRIED VEGETABLES.—PLANTAINS, CABBAGES, &c.

BY PROFESSOR LINDLEY.

In Mexico, dried plantains enter largely into the consumption of the people in the mining districts. Dried plantains possess considerable nutritive value, and are at the same time exceedingly agreeable to the palate, while they are cheap and easy to prepare. But what I would more especially mention in respect of them is, that the plantains which lie there, perfectly sweet, and having undergone no material change whatever up to the present time, were sent into a baggage-warehouse at Woolwich, in the year 1835, and had there been lying till they were transferred to the Exhibition building. It thus appears that dried plantains are not only exceedingly good to eat, and highly nutritive, but have the property, which many such substances do not possess, of keeping for a very long time,—a fact that should interest those who deal in figs and similar articles which are apt to become mity and dry, and to spoil, to the loss of those who own them. It is certain that there is no good property belonging to the fig which does not also belong to the dried plantain. It appears from the statements of Colonel Colquhoun, to whom we owe our knowledge of the preparation, that such dried plantains can be prepared in Mexico, and sold in Europe for threepence a pound, allowing 10 per cent. profit, supposing there is no duty on their import.

The Great Exhibition contained also some examples of dried vegetables, prepared by what is called Masson's process. The mode of preparing these vegetables is shortly as follows:—They are dried at a certain temperature (from 104° to 118° F.), which is neither so low as to cause them to dry slowly nor so high as to cause them to dry too quickly; if the latter happens, they acquire a burnt taste, which destroys their quality. They lose from 87 to 89 per cent. of their water, or seven-eighths of their original weight, after which they are forcibly pressed into cakes, and are ready for use. I saw, a year ago, the original of a letter from the captain of the *Astrolabe*, a French vessel of war, speaking in the highest terms of the supply of these vegetables for the use of that vessel during her voyage; the French navy generally mentions them in the most favorable terms, and no reason appears for doubting such statements.—*Mechanic's Magazine.*

ON WHITE LEAD AND WHITE ZINC PAINT.

BY M. L. GARNERAY.

Since white zinc paint has become an article of commerce I have devoted

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myself to making comparative experiments between this color and white lead. I have also had recourse to the information which M. Leclaire, who brought it to perfection and who uses it daily in great quantities in every degree of exposure, has kindly given me, and the following are the results of our observations.

The application of white lead over the white zinc causes in a very short time very decided cracks. The mixture of the two whites produces the same effect.

I proved that white zinc applied over white lead, and exposed to the open air, and to insolation during two years, did not produce them.

White zinc and white lead being ground separately in equal quantities, with the same quantity of oil of the same quality, both applied with similar brushes upon the same stucco, and both dried under cover in in the same conditions, the following were the results.

After the lapse of a year the white lead having absorbed a certain quantity of sulphuretted hydrogen gas had become black, whereas the tint of the white zinc had not sensibly varied.

Here is another as conclusive a fact. In a large staircase an imitation cornice having been painted with white zinc, the decorator, who was to have finished it by painting the light parts in relief with white, having made a mistake in the pot he took, and having taken for them pure white lead instead of white zinc, it happened that some time after the termination of the operation, the lights painted with white lead detached themselves quite black, from the demi-tints painted with the white zinc.

I have heard it said by several persons that the white zinc did not cover well and did not dry, that it was difficult to use in the azure tint; I am going to reply to these objections by the results of my observations.

The white zinc covers as well as white lead when it is a little "fat." In truth, white zinc is ten times longer in drying than white lead; but, if this undrying quality is sometimes an inconvenience, is it not also an advantage for artists when they are obliged to work for several days on the same part.

I speak here, be it understood, of white zinc rubbed up with natural linseed oil; for by mixing it with boiled oil, but too little to alter the tone, it is then only twice as long in drying as white lead.

I know that it is difficult to use, that it is far from being as adherent to itself; in one word, if I may thus express myself, that it is *shorter* than white lead. This is its well known defect, and M. Edouard, color merchant, an experienced man who is very careful how he rubs up his colors, is about to remove it entirely.

But to render it more unctuous, more manageable, *longer*, I do to it what I did to white lead when I found it too liquid and too slippery; I enclose my white zinc between blotting paper, and after dessication for an hour or two, either in the sun or at a gentle fire, when it is sufficiently *glutinous*, its employment is nearly as satisfactory as one could wish.

It may be rendered yet more *long* by mixing with it a little linseed oil which has been boiled for two hours, or some of the same white which has been rubbed up for two years.

Finally, there is a more simple means of attaining the same, that is to leave it for two years in the bladder.

As for the azure tint, it is an incontestible fact; but surely this almost imperceptible shade is well made up for by the richness of its tone, which is unequalled by any other white! Moreover, I think I may assert that if a picture be allowed to remain a year before it is varnished, the influence of the animal emanations will by that time have brought it to that glowing tone which harmony requires and which all colorists seek. Moreover, this white has the immense advantage of preserving better the tints and value of the colors with which it is mixed.

Hitherto I had only used white zinc as a specimen, or for the purpose of preparing my canvas for painting; but as this should not be the limit of my experiments, I wished to see how it would succeed in the execution of the painting in a picture, so as to study it better in all circumstances, and to be able to point out with more precision both its good qualities and its defects.

For this purpose, and thus guided, I proceeded to operate on my own works. I therefore painted pictures all in white lead, as they contained some very brilliantly white parts, such as the light part of waves and their foam, I heightened them with white zinc.

I did not at first observe much difference between the tints of these two whites; but six months afterwards, the zinc had assumed so much power by the side of the lead that the pictures showed a sensible disparity between the two colors. The lead had become blackish, and the zinc, as much by the contrast as because it had remained pure, had destroyed the harmony of the pictures; the zinc stood quite apart.

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I have preserved these pictures as proofs of what I advance.

Although these circumstances appear to me perfectly conclusive, there still remained to convince me to try the varnish; for I thought that this agent might cause some modifications in the inharmoniousness of the two colors in question. The varnish was therefore applied six months after the termination of the pictures, but it acted in so insensible a manner that the want of accordance in the tones was scarcely diminished.

From the preceding, I would not advise painting with white lead on canvas prepared with white zinc.

Finishing with white zinc a picture commenced with white lead;

Still less finishing a picture with white lead which was begun with white zinc;

Nor painting pictures with white lead.

But I think I may assert that to preserve the tones, and not to fear cracks, it is necessary to paint pictures with white zinc on stucco prepared with white zinc.

Now, as the results of all my experiments are too evident and too conclusive in themselves for the least comment to be necessary, it appears to us that it now remains for artists to make their own choice between the color which preserves the purity of the tints in a picture and that which blackens them.—*Journal de Chimie Médicale*, April, 1852.

RESEARCHES ON THE ACTION EXERTED BY THE SALTS OF IRON IN THE ACT OF GERMINATION, AND IN THAT OF VEGETATION.

BY M. J. L. LASSAIGNE.

In the memoir which we now present we propose to study the influence which the salts of iron exercise on the developement and growth of vegetables, and to prove by means of experiments whether these mineral compounds are absorbed and retained by the organs of plants.

This question, treated in this point of view, being connected with vegetable physiology, should also lead to the explanation of some practical facts observed in agriculture as to the mode of action of the salts of iron in the act of vegetation, which have already been published.

The series of questions which it appeared to us important to examine, may be thus subdivided, and ranged in these three propositions:

1st. Are the soluble salts of iron favorable or injurious to germination and vegetation?

2nd. Do these compounds, when mixed with the earth in fields and gardens, where these two phenomena must be accomplished, preserve all their action, or do they undergo a decomposition which modifies their properties?

3rd. Are the salts of iron, which are insoluble or sparingly soluble in water, mixed, in determined proportions, with earth, absorbed by the radicles of plants, and carried into the various organs with the other minerals assimilated?

For the purpose of treating these different points we undertook the following experiments, which confirm many facts already known, and add new ones.

FIRST EXPERIMENT.—On the 31st May, 1851, we mixed 4 grammes of crystallised proto-sulphate of iron, previously dissolved in 30 grammes of water, with 400 grammes of good garden earth; this mixture was stirred and agitated with a glass rod so as to moisten every part of the earth as equally as possible. Ten minutes afterwards a portion of this mixture was separated from the mass, mixed with five or six times its volume of cold distilled water and immediately passed through a filter of blotting paper. The filtered liquid, tested by *ferrocyanide of potassium, hydrosulphate of ammonia*, and *infusion of nut galls*, immediately gave evidence of the presence of the *soluble salt of iron* with which the earth had been impregnated. This preliminary preparation being terminated, the earth with the addition of the ferruginous salt in question was spread on a sheet of sized paper in a layer of about a centimetre in thickness. This layer, which was stirred at intervals, dried on the surface, by degrees taking a *yellowish brown tint* due to the decomposition of the sulphate of iron in contact with the air and carbonate of lime contained in the earth which was operated upon. After *eighteen hours* a new portion of the earth was tested by washing it with cold water on a filter, and at this time the above quoted reagents shewed in the filtered liquid no trace of any salt of iron. This observation indicated, therefore, that the sulphate of iron used in this mixture was completely decomposed, and that from this decomposition, which might have been anticipated under the circumstances in which this experiment was made, had resulted in *soluble sesquicarbonate of iron* and *sulphate of lime*. The washing water, in fact, gave abundant precipitates with *nitrate of baryta* and *oxalate of ammonia*, and was without action on the reagents used to dicover salts of iron.

The artificial mixture of earth and ses-

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quicarbonate of iron representing, according to the quantity of sulphate of iron employed, 1·10 gr. of peroxide of iron in 400 grammes of earth, was placed in a pot of baked clay, and in it, on the 1st April, we sowed 0·50 gr. of millet seed (*panicum miliacum*).

In another equal quantity of garden earth, without the addition of the salt of iron, we sowed, as a comparison, an equal quantity of millet seed. The two pots containing the seeds, were placed under a large hand glass, after the earth had been moistened with equal quantities of distilled water. Four days after, germination had commenced in each vessel with the *same activity*, and from this moment every necessary care was taken to watch the different phases of this act.

SECOND EXPERIMENT.—Another portion of garden earth weighing 300 grammes was mixed with 8 grammes of commercial sesquicarbonate of iron. In this mixture, moistened with distilled water, 0·5 gr. of millet seed were sowed at a slight depth. This new sample was placed by the side of the other vessel, and likewise watched.

THIRD EXPERIMENT.—0·130 gr. of perchloride of iron dissolved in a quantity of distilled water, were mixed with 100 grammes of pure siliceous sand, washed with water acidulated with hydrochloric acid (this quantity of perchloride representing exactly 0·067 gr. of anhydrous peroxide of iron). This mixture, moistened by a certain quantity of distilled water, was introduced into a vessel of enamelled china, and a small quantity of millet seed was sown in it. After eight days, during which the heat had been maintained at between 55° and 57° F., no sign of germination was perceived. Some seeds, then removed from the sand in which they were buried, seemed but little swelled, their episperm was *colored brown*, and the germ, which had scarcely emerged from the seed, appeared to have been arrested in its developement. Some days after all the seeds were removed from the sand in which they had been sown, and it was proved by their aspect and the *brown color on the surface*, that the act of germination could not be accomplished in such a medium.

These seeds when washed in water, to remove the ferruginous salt which adhered to their surface, preserved the brown tint, which we considered due to a combination of a quantity of the salt of iron with the nitrogenous matter contained in the episperm. In fact, a certain quantity of these same seeds, plunged in an aqueous solution of *tannic acid*, became in a short time of a *blue black*, and the incineration of another portion of these seeds gave a *reddish ash*, in which the evidence of peroxide of iron was evident.

FOURTH EXPERIMENT.—Into this same siliceous sand, impregnated as above described, with $\frac{13}{10000}$ of its weight of perchloride of iron, were transplanted, with necessary precautions, four small plants of *Delphinium ajacis*, which had perfectly developed themselves in the good earth of the garden. These plants could not continue to vegetate in this artificial soil; they withered by degrees, drooping, and after *four days*, their dead and partly dried up stalks lay on the surface of the sand; removed from this medium, their examination showed that the greater part of the body of the root and all the radicles had assumed a yellow tint similar to that of chamois leather, which prolonged washing in distilled water failed to remove. These roots, plunged in a weak solution of *tannic acid*, soon took a blue black tint, especially in the parts which joined the radicles, and not in the points situated above. A portion incinerated in a platinum crucible left a small quantity of reddish ash, in which the presence of peroxide of iron could be easily proved by treating it with hydrochloric acid and the reagents whose property it is to discover it. An equal quantity of roots detached from the plants growing in the garden earth, furnished, by calcination, a white ash containing only traces of peroxide of iron.

FIFTH EXPERIMENT.—Four plants of wheat, taken from a field were first washed in plenty of water to remove all the arable earth which adhered to their radicles, and then immediately replanted in the preceding sand, at two o'clock on the 26th April. On the 28th these two plants were quite withered and dead. They were removed from the sand, and after washing in cold water to remove the adhering sand, they were examined. One of these roots, plunged in a solution of tannic acid, was colored black as in the preceding cases; the other incinerated in a crucible produced a small quantity of ash colored of a pale brick red.

SIXTH EXPERIMENT.—An artificial soil was formed by mixing 88 grammes of garden earth and 12 grammes of commercial hydrated sesquicarbonate of iron; this mixture being moistened with a sufficient quantity of distilled water, ten millet seeds were sown in it, which developed themselves as in the common garden earth. The leaves had a green tint equal to that of leaves developed in ordinary earth, they were neither wider nor longer; after about six weeks,

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the plants produced were removed to be examined. The roots, well washed to cleanse them from the ferruginous earth on their surface, plunged in a solution of tannic acid were not colored, which proves that the salt of iron which had been in contact with them, by reason of its insolubility in water, had not been able to combine in their tissue as we have already observed in the roots of plants put in contact with soils containing soluble salts of iron.

The leaves and stalks of these plants were 0·065m. in height from the roots; dried in the oven, they gave a weight of 0·210gr. and furnished by incineration 0·022gr. of a greyish white ash mixed with very white portions, an ash in which there were only to be found imponderable traces of oxide of iron.

The plants proceeding from the sowing of millet seeds in earth mixed with sulphate of iron and in common garden earth, were removed from the soil in which they had developed themselves after the lapse of forty-five days; the green color of the foliage was identical, and did not enable us at the first view to distinguish the plants which had grown in the ferruginous soil from those whose developements had taken place in common earth. The height of these plants, the roots included, was nevertheless different, it was 0·065m. for the plants removed from the ferruginous soil, 0·085m. for those developed in the ordinary earth without the addition of the salt of iron.

These plants were dried in a stove and then subjected to incineration in a platinum capsule. The ashes of the plants which had vegetated in the soil with the iron had a slight redness, but more distinct than those of the plants developed in the common earth; the weight was also different; the first weighed 0·052gr., and the second 0·057gr. Dissolved in pure hydrochloric acid diluted with water, they gave solutions of a pale yellow color, which were evaporated to dryness in a porcelain capsule to drive off the excess of acid. The saline residue redissolved in distilled water acidulated by a few drops of hydrochloric acid, gave a solution which was precipitated by an excess of liquid ammonia. The slightly yellow flaky precipitate which was produced, was collected by decantation and washed with distilled water. To determine the small proportion of peroxide of iron found in it mixed with the sub-phosphate of lime, we adopted the following method which appears to us capable of application in many cases of mineral analysis, and is based on the principle which we have proved experimentally: hydrated peroxide of iron diluted with water, being heated with an excess of hydrosulphuric acid, is transformed into hydrated sesquisulphuret of iron, of a greenish black color. This sulphuret, treated by chloruretted water, is completely decolored, and by the quantity of chloruretted water the preexisting proportion of peroxide of iron may be determined. A first experiment being made with a known weight of dissolved metallic iron, it then becomes easy to establish by the volume of chloruretted water used to decompose the sesquisulphuret of iron produced, the proportion of this metal. In using this siderometric means it is important for obtaining an exact result, to make two comparative experiments for each determination of the iron in an ash, one with a solution of the ash, the other with a known solution of pure iron in *aqua regia*; this double test is necessary, for the aqueous solution of chlorine alters very quickly even when kept in the dark.

It is by these simple means which are within the power of the least experienced person, that we have appreciated the small quantities of iron which would doubtless have been impossible to determine by weight in the small quantities of ashes which we have at our disposal.

The ashes of the plants proceeding from the germination of the millet seeds in the earth to which had been added the salt of iron (protosulphate of iron), gave 0·0005gr. of metallic iron in 0·052gr. of ash. The ash of the millet grown in ordinary earth as a comparison, gave in 0·057gr. 0·0004 of metallic iron, or 70 per 10,000 of ash.

In another experiment in which the vegetation of the plant of millet had continued for two months and a half in the same conditions, the analysis of the ash proved that the proportion of iron was different, for we found, by the above mentioned method, that these ashes contained $\frac{1}{600}$. These sprays of millet, grown in ordinary garden earth gave ashes which contained only $\frac{1}{952}$.

The germination of the millet seeds and the vegetation which followed it, in a soil composed of 88 parts of garden earth to only 12 parts of hydrated sesquicarbonate of iron, demonstrated that the stalks and roots of these plants, after six weeks' vegetation, did not contain more iron than those gathered from ordinary soil.

The insolubility of this hydrated sesquicarbonate of iron would, doubtless explain the want of effect in the experiment which we mentioned. The roots which had been in immediate contact with this artificial fer-

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ruginous soil had not absorbed any portion of this salt with a base of iron, for a prolonged immersion of them in a solution of tannic acid showed no coloration; they preserved their primitive whiteness, which did not take place in other soils containing a soluble salt of iron, or one susceptible of becoming so by its contact with water charged with carbonic acid. (First experiment.)

The presence of a very small proportion of oxide of iron in the ashes of various plants having vegetated, either in arable or garden soil, has led us to estimate this proportion by employing the peculiar process which we have used in the preceding experiments. The results which we have obtained shew that in the various kinds of dry provender, such as hay, straw, and lucerne, the proportion is very small and variable: that it rises to $\frac{1}{1666}$ in the ash of hay, to $\frac{1}{3173}$, in that of straw, and to $\frac{1}{833}$ in the ash of lucerne; that the commercial oats which we examined contained in their ash this last proportion, namely $\frac{1}{833}$.

These variations observed in the quantity of iron existing in the ashes of these vegetable products doubtless depend upon a diversity in the composition of the soils, and especially on the proportion and peculiar state under which the iron is found. In fact, the direct experiments which we have undertaken, and which are reported above, demonstrate postively that the addition of a salt of iron to garden soil augmented the proportion of iron in the ash in the ratio of $\frac{1}{600}$ to $\frac{1}{952}$. This last fraction expresses the amount of iron existing in the ash of the same plants having vegetated in ordinary garden soil.

The following appear to us to be the results of the obervations reported in this memoir:

1st. That the soluble salts of iron which undergo no decomposition in siliceous earths when introduced into them, are essentially injurious to germination and vegetation, even when in very small quantity, as shown by the third, fourth, and fifth experiments in this memoir.

2nd. The results which we have announced therefore confirm the opinion advanced by Count de Gasparin, in his *Traité d'Agriculture*, with regard to sulphate of iron and vitriolised earths. (Vol. I, pages 104 and 662).

3rd. That when mixed with arable soils more or less rich in calcareous earth (carbonate of lime), the soluble salts of iron are slowly decomposed, according to the state under which they present themselves, and are transformed into carbonates of protoxide or peroxide of iron, which no longer exert an injurious action on the tissues of seeds and plants, and may afterwards, by reason of their slight solubility in water charged with carbonic acid, be absorbed in small quantities by the radicles, as shown in the first and second experiments.

4th. That the mode of germination and vegetation in ordinary arable soils, and in those to which have been added a small portion of a salt of iron, present no sensible difference.

5th. That no difference is observable in the green color of the stalks and leaves, in the opposite conditions which we have mentioned.

6th. That the injurious action of salts of iron on seeds and radicles of plants appears due to the astringent influence which they exert on organic tissues in general, and to the combination which they contract with these last, by modifying and finally annihilating their vital functions; that under these circumstances these metallic salts act on the vegetable nitrogenous tissues as on the animal membranes and tissues.

7th. The facts which we have proved in this memoir by putting in direct contact the seeds and roots of plants with small quantities of soluble ferruginous salts, would tend to explain that the efficacy often perceived in these same salts employed in small quantities and by means of watering, were not due to absorption, but to an action differing from it essentially. The absorption of a certain quantity of these salts leads to the death of the plants, especially if by these means the roots come into contact with them.

8th. The employment which was made and published in 1851, in the Report of the sittings of the central Society of Agriculture, by M. Ponsard, of a solution of 100 kilogrammes of sulphate of iron in 500 killogrammes of water to destroy a parasite on a lucerne, would, according to us, find an explanation in this circumstance, that the roots of the first plant would be accessible to a certain quantity of ferruginous salt undecomposed by the soil, whereas those of the lucerne would not be subject to this influence.

9th. That the small proportion of oxide of iron found in the ashes of all the plants of the fields and gardens attests that this oxide, which forms a constituent part of the earths and manures, is capable of being absorbed during the act of vegetation, and that the addition which was made to these products of a certain quantity of ferruginous salts only augments in a very slight degree the normal amount of iron in dicated in them by analysis.—*Journal de Chimie Médicale*, May, 1852.

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ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.*

For improvements in the mode of distilling and treating organic substances and bituminous matters, and in the treatment of their products, together with the apparatus used for the said purposes.
ETIENNE ALEXANDER ARMAND, of Paris. Patent dated December 19, 1851.

It is well known that when organic substances, such as wood, coal, fats, gum resins, horns, hides, and animal waste of all sorts, are heated in a closed vessel, decomposition ensues with the production of volatile bodies, which are sublimed, and of a solid residuum, which remains in the vessel: the same also occurs when bituminous ore is used — the residuum in this case, however, being the sandy or earthy substance which served as the basis of the ore, while, in the former case, it is charcoal more or less pure. The other products of this distillation are of various kinds; namely gas and vapors, which are condensed into vinegar, water, essences, coal-tar, &c., and the proportions in which they are obtained will, of course, vary with the nature of the substances operated on.

Attention has been directed, in different trades, to the best modes of collecting increased proportions of certain of these products at the expense of the others; thus the vinegar manufacturers use wood, which they distil at a low temperature, while gas-makers use coal at a high temperature, in order to obtain as large a proportion of gas as possible without producing ammonia or coal-tar. Sometimes it is an object to produce oil and bituminous matters, and for this purpose bituminous ores, resinous substances, and the inferior descriptions of coal-tar, are used. The invention of the patentee relates to the distilling of these substances, and is founded on the consideration that the elements of the gas and tar being the same, it is possible to obtain the one from the other; that is, gas from tar, and from gas in contact with tar a liquid product rich in hydrogen, which by dissolving in the tar, modifies its character. In this new system of working, the volatilised gases, instead of being condensed as usual, are made to pass through boiling tar, or hydrocarbonaceous matter, so as to obtain a reduced quantity of gas, and a new product by the absorption of part of the gas in the tar or tar-oil used.

The distillation of the bituminous matters is conducted as follows: —The matters are placed in cases, which are introduced into two or more open-ended retorts placed side by side in the same furnace. At both ends of the retorts are provided condensing apparatus, divided into three compartments, each containing pyrogenic oil of a specific gravity 0·90 to 9·96, which, during the working of the apparatus, is raised to different degrees of heat, and through which successively the gases, on escaping from the retorts, are caused to pass, so that portions are condensed therein, while the uncondensable gases are conducted away to a gasometer for being burnt or otherwise used. The condensing apparatus being so contrived that it shall be of different degrees of heat in the different compartments, the products contained in them will be found to be of various densities—the lighter and most volatile being in that part of the condensing apparatus where the temperature is lowest, and the heavier products being in that where the heat is more directly applied. When the nature of the working will not admit of the above apparatus being used—as, for instance, in manufacturing coke—the gases may be caused to traverse a vertical shaft full of pebbles, through or among which the hot oil is caused to trickle. The products obtained by this operation would be treated the same as those from the process just described.

For the purpose of purifying and decolorising the light oils thus obtained, the patentee adds to them about 1 per cent. of nitrous sulphuric acid, which is poured gradually in, so as to prevent heating of the mixture, the oil being kept the while in a state of agitation. After a short time the oil clears itself, and the coloring matter is deposited; the oil is then decanted, and washed, first with lime-water, and afterwards with water alone, after which it is distilled in combination with a concentrated saline solution (composed of equal weights of an alkaline chloride and nitrate, such as sea-salt and saltpetre), in order to absorb any sulphurous acid that may still remain in it, and to produce steam, by which the distilling operation is found to be facilitated. For the purpose of conducting this process, the patentee makes use of a modification of the calcining apparatus before mentioned. Instead of using nitrous sulphuric acid for rectifying the light oil, concentrated sulphuric acid, with peroxide of manganese, may be employed, or acid and permanganate, or chromate of potash, or any suitable oxidizing body. Instead also of the above-mentioned saline solution, a melted mixture of anhydrous lime and potash may be substituted, and the oil caused to come in contact with the same, which is well adapted

* Collected from the *Mechanic's Mag.*

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for combining with any sulphurous acid and clearing the oils.

The heavy oils are treated by mixing them with about 1 per cent. of nitrous sulphuric acid, or of the above oxidising mixtures, and allowing them to stand for a short time. The liquor is then decanted, and washed repeatedly with warm lime-water, after which the oil is mixed with about 3-7ths by weight of fixed oil, such as rape oil, &c., with the addition of about 2 per cent. of the oxidizing mixture. The whole is then agitated until it becomes of a rich violet color The patentee now again uses weak lime solution, or steam, which precipitates the sulphurous acid, and he filters the liquid, when the oil will be found to have become of a yellow color, and perfectly transparent. The separation of the acid is a slow process, and to effect it perfectly it is necessary to wash repeatedly, and allow the mixture to stand two or three days after each washing. Another process for treating these heavy oils is as follows :—The patentee mixes the fixed oils after the second addition of oxidising matter, and he then decants the liquor, washes it with slightly alkalised water, and places it in a sand-bath heated to about 390° Fahr. for about six hours.

The heaviest oil may, without any preparation, be used as a grease for machinery and carriages, or it may be distilled to any required degree of concentration. A solid grease may be produced by mixing the heaviest oil with about 10 per cent. of resin or of a fixed oil or fat, and treating the mixture with a solution of lime and potash, or lime and soda, at a heat of 212° Fahr., and agitating continually until the mixture becomes mixed. When cold, the compound grease is of a brown color, and fit for greasing carts or railway carriages.

Claims.—1. A mode of calcining or distilling solid organic substances or bituminous matters, by placing the same in earthenware or metal cases, and introducing the cases into the retorts instead of placing the substances directly into the retorts.

2. A mode of collecting the volatile products from the calcination, by which the said products are made to pass through hot pyrogenic oil, whereby a part of the uncondensable gas is transformed into condensable vapors, and those vapors are condensed into liquids of different densities by passing through vases differently heated.

3. The several described methods of treating the light oils, heavy oils, and bituminous matters by means of the specified chemical processes when working the apparatus described.

4. A mode of distilling any kind of liquid organic substance and bituminous matter, similar to that claimed for dry substances, but with this difference, that instead of placing inside the retorts open cases containing the solid substance, a closed case inside the retort, with suitable openings, is employed, the said case being connected by any suitable providing contrivance, such as described, with the vessel containing the liquid substances, which is preferred to be placed outside the retort, and further, a particular contrivance for heating the liquid substance on its way from the reservoir in the case.

The use of a closed case with side openings, such as used for distilling liquid substances, may be preferable to open cases for the working of bituminous or asphaltic solid ore. In treating such, the patentee adds about 10 per cent. of light oil, and heats the retort to 390°. The oil dissolves the bituminous matter, and vapors are formed, and the liquid forced from the cases into receivers, where it is concentrated. When no more liquid comes over, the case is withdrawn, and will be found to contain only the earthy basis of the ore.

Improvements in the preparation and treatment of fibrous and membranous materials, both in the raw and manufactured state, whereby they are rendered more durable, are contracted or expanded, are cleaned, and are more capable of receiving and retaining colors. RICHARD ARCHIBALD BROOMAN, of the firm of J. C. Robertson and Co., of 166, Fleet Street, London, patent agents. (A communication). Patent dated Oct. 10, 1851.

The nature of the invention consists in the formation of certain salts or compounds within or in contact with fibrous and membranous materials, both in the raw and manufactured state, or in the decomposition of certain salts or compounds already existent in or combined therewith, whereby they are in either case rendered more durable, or contracted or expanded, or cleaned, or made more capable of receiving and retaining colors. And the manner in which the said invention is performed is as follows :

Where the material is of a fibrous nature, such as flax, I prepare it for being treated as aforesaid, as well as for manufacturing purposes generally, by means of the described crushing and cleaning machine.

To produce a " contracting, " or as it is technically termed " milling " or " felting " effect on the goods operated upon, I so combine certain substances as to form a compound or salt incorporated bodily therein, or

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intimately combined therewith, taking care that the combination is not preceded by decomposition. For example, I steep the goods in dilute sulphuric acid, and then without any intermediate washing, immerse them in caustic soda, whereby a sulphate of soda is formed, which produces the desired result. Other acids than sulphuric, and other hydrates than soda may be substituted. If I employ oleic, or any other similiar organic acid, instead of sulphuric, a compound is formed in the material itself, and the same result obtained.

To produce an expansive effect, or on the opposite to contraction, or milling or felting, I first saturate the material with some compound (say, for example, a carbonate), which on subsequent contact with an acid will suffer decomposition, accompanied by the escape of gas. I sometimes employ instead of an acid, some salt, such as alum, which having an acid reaction, decomposes the first compound, and sets free the gas. Mere heat alone may be made to serve the same purpose as the acid body; and so also cold may be substituted for the alkaline action. Thus, milling or felting may be produced by immersing a heated body suddenly in a cold medium, and expansion effected by reversing the process.

To clean or decolorise fibrous or membranous substance, I first produce chemical decomposition in the substance itself. By decomposition, here is meant the separation of the constituents forming a compound body, which separation must always be accompanied by an evolution of gas. Thus, if a substance be immersed in a carbonate, and then exposed to the action of sulphuric acid, carbonic acid in the state of gas is evolved, and a sulphate of the base is formed. Instead, therefore, of following the ordinary chlorine bleaching process, I proceed in the following manner:—Suppose white China silk is the article to be operated upon, I first immerse it in a solution of sulphate of magnesia, then transfer it to a bath of carbonate of potash or soda, upon which an insoluble carbonate of magnesia is formed in the silk; I then dip the silk so impregnated in an acid which will decompose the corbonate and form a soluble salt which is afterwards easily removed by washing.

A good compound for cleansing as well as for milling and felting purposes, is formed by combining some oily, fatty, or resinous compound (hydrocarbons) with an alkaline carbonate or hypochlorite. In this case, a hot solution of carbonate of soda is first prepared, and there is then added to it cold oleine, fat, resin, or other suitable hydrocarbon until the base is saturated. To facilitate the combination of oily, fatty, or resinous compounds with alkalies, I saturate cloth or other porous material, such as pumice-stone, with the oily, fatty, or resinous compounds, and then boil it in an alkaline solution, by which means I obtain a larger surface to act upon.

To preserve animal or vegetable substances, I form a salt or compound of an antiseptic nature within their cells or fibres, taking care that the combination is not preceded by decomposition, or accompanied by the evolution of any gas. Thus, for example, to preserve meat, I immerse it first in muriatic, nitric, or acetic or saccharic acid, or other equivalent compound, and then into a solution of some basic hydrate, which, with the preceding acid or any other equivalent acid or compound, will form in the meat itself an antiseptic salt. The meat thus treated will be perfectly wholesome, and will keep so for a long time.

To preserve and tan hides and skins, I from in like manner within those substances some conservative salt; for example, I steep them in tannic or other similar acid, and then immerse them in a mixture or solution of some hydrate, such as those of soda, lime, magnesia, baryta, or alumina.

As it is important, however, to avoid the formation of tannates of soda or potassa, on account of the deep color communicated by them to the hides, I prefer those bases which, with tannic acid, give the least amount of color; such for example, as magnesia.

To preserve wood, canvas, and other like fabrics, I form a salt within the fibres thereof, by first immersing them in some suitable acid; such as sulphuric, pyroligneous, or muriatic, and then in a solution or mixture of some suitable base.

If I wish to produce color in wood or any other vegetable substance, as well as to preserve it, I use a solution of catechu or some other coloring material, and afterwards a solution of caustic soda or potassa, whereby subinate of soda or potassa is formed within the fibres of the substance.

To promote the germination of seeds, and cause them to throw out powerful first and seconds sets of leaves, whereby they may the more rapidly and effectually absorb food from the air, I form some fertilizing or stimulating compound within the seeds themselves in manner following:—I steep the seeds in phosphoric acid, and then in ammonia, potassa, or lime, whereby a phosphate of one of those bases is formed within the seeds.

To increase the power of absorbing and retaining coloring matters in animal and vegetable substances, I form mordants or the

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constituents of the mordants therein, as follows:—If, for example, I wish to use acetate of soda as a mordant, I do not immerse the material in a solution of that salt, but I dip it in acetic acid, and then in caustic soda, without any intermediate washing.

I may mention the employment, as mordants, of certain alkaline combinations with hydrocarbons; such as of turpentine with potassa, naphtha with potassa, soda, fusel oil with potassa, &c.

Or the coloring matters or their constituents may be combined in the fibre, fabric, or membrane itself. Fabrics and membranes may also be printed by similar means. Thus the pattern may be stamped by the acid or alkali, and the whole article then immersed in the solution of the base or acid, the mordant will only act on the spots where the acid is in contact with the cloth or membrane.

I may mention, also, that salts may be formed or decomposed, for the purpose aforsaid, by the action of gaseous bodies on them—as, for example, by exposing hydrate of soda to sulphurous acid, chlorine, or carbonic acid; also by exposing a carbonate in solution to sulphurous acid or chlorine gas.

In all the foregoing processes, and in the examples given, the effects produced are supposed by the inventor to be the result of some peculiar electrical condition communicated to the fibres, fabrics, or membranes by the combination or decomposition of salts in intimate contact therewith. Aware of the enormous developement of electricity which accompanies chemical action, he believes that, by altering the electrical condition of animal and vegetable substances, a state of polarity is produced, or what is usually denominated a negative or positive result, on which the power of any substance to contract or corrugate (milling and felting), to resist decomposition, or to receive and retain colors, mainly depends. He further considers that electric currents move in two opposite directions, either centrifugal or centripetal, and that many of the phenomena attendant upon the absorption or loss of color,—as in dyeing and bleaching, or the twisting and currugation of fibres, as in milling or felting, or the resistance of decay, as in tanning and salting,—depend upon the kind of electricity developed at the time, and that such condition of electricity can be established by the means herein before described. It seems to follow, moreover, from the principles laid down, that by simply reversing some of the processes given as examples, an opposite effect should be produced; and so, in point of fact, it is found that if the process given for preserving meat is reversed, its decay is accelerated.

The principal materials to which these processes are applicable, are the following: flax, hemp, cotton, jute, manilla-hemp esparto, aloe, pine-apple-leaf, and generally all vegetable fibres, and yarns of fabrics made therefrom, woods, roots, leaves, seeds and fruits, meat, skins, hides, hair, wool, silk, animal fibre, fish, and all products thereof.

Among the salts most suitable to be employed are the following:—Rubinates; such as rubinates of magnesia, alumina, &c. Tennates; such as tennates of magnesia, lime, ammonia, soda, and potassa, &c. Sulphates,—as of magnesia, soda, &c. Salts with an acid reaction, as alum. Carbonates; as those of magnesia, soda, &c. Hydrates; as those of lime, soda, potassa, alumina, magnesia, &c. Acetates; as of soda, magnesia alumina, indigo, &c. Acids of every description may be used; such as acetic, muriatic, sulphuric, nitric, tannic, silicic, &c., and any of the hydrocarbons; such as resins, oils, sugar, starch, &c. The foregoing compounds, however are merely mentioned as examples, for the inventor does not confine himself to these alone, but claims a right to the use of all known chemical equivalents.

And having now described the nature of the said invention and in what manner the same is to be performed, I declare that the improvements claimed as embraced by the said invention, are as follows:—

First. The crushing and cleansing machines respectively represented in figure 1, and in figures 2 and 3, and before described; that is to say, in so far as regards the combination of conducting, crushing, and oscillating rollers with a "bott hammer," in the manner herein represented and before described.

Second. The treatment of fibrous and membranous substances, both in the raw and manufactured state, by forming or decomposing salts or compounds within, or combined with the same, whereby they are rendered more durable, or are contracted or expanded, or cleaned, or made more capable of receiving and retaining colors, as before exemplified and described.

Third. The use of tannate and rubinate of magnesia, for the treatment of membranous and fibrous substances; such as hides and skins, wood, &c., as before described.

And, *Fourth.* The employment for cleaning fibrous and membranous substances of a compound of an alkaline carbonate, or hypochlorite, with a fatty or oily, or resinous body, as before described.

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Improved apparatus for generating gas, which apparatus may be used for heating and other similar purposes, and other apparatus for heating and ventilating. DONALD HENDERSON, of Glasgow, ironmonger. Patent dated October 23, 1851.

Claims.—1. A gas-producing apparatus to be used in conjunction with a kitchen range, or with a drying and heating stove for the generation of carburetted hydrogen, gas, wherein the condensed or first liquid products in the manufacture of gas are returned to the retort or retorts for further distillation, whereby a greater amount of gas is obtained, and the whole of the liquid decomposed,

2. A hydraulic valve applied to the channel through which the liquid products are returned to the retort in order to prevent the escape of gas by that passage, while, at the same time, the liquids have free access thereby to the retort by gravitation.

3. The arrangement of the hydraulic main, condensers, and pipes in connection therewith in such relative positions as will permit the liquid products to return to the retort by gravitation.

4. A safety-valve for the purpose of preventing too great a pressure of gas accumulating in the retorts of gas-holders.

5. An arrangement of gas heating apparatus to be applied to baths. (The burners are placed in the interior of a small cylindrical boiler or water-space, at one end of the bath, communicating by pipe, above and below, with the bath. The heated water ascends into the upper part of the bath, and its place is constantly supplied by fresh water from the lower part. The sides of the bath are formed double, and the products of combustion are caused to traverse the flue thus formed, and thereby act to, in conjunction with the burners, facilitate the heating of the water.)

6. A gas ventilating apparatus. (This apparatus consists of a cylindrical double casing with perforated sides, between which the burners are placed. The hollow in the centre of the casing is in communication with the room to be ventilated at its lower part, and with the external air at its upper. The combustion of the gas produces a rarefaction of the air, by which the vitiated portions are drawn off, and the ventilation effected.)

Improvements in the manufacture of pipes, chimney pots and hollow vessels; also bricks, tiles, copings, columns, and other articles used in building houses and other structures. HENRY ADCOCK, of Northumberland Street, Strand, civil engineer. Patent dated October 23, 1851.

Mr. Adcock's improvements consist in manufacturing the articles enumerated in the title from the stone, rock, or stony material known as basalt, trap, rowley-rag, whinstone, and others of the same geological genus, by melting the same and then running the melted material into suitably-shaped moulds.

For the purpose of melting the basaltic rock, a reverberatory or other suitable furnace may be employed, and the materials may be either melted in pots or crucibles or on the bed of the furnace. The moulds employed are preferred to be made of metal, and when casting, they are brushed over inside and out with casters' "blacking." When a polished or smooth surface is desired to the article to be cast, the interior of the mould is polished with black lead. It is preferred in casting to heat the moulds even to such an extent as to retain the material in a fluid state after it has been poured into them; or the material may be kept fluid in the mould by the direct application of heat. According to the heat employed, and the length of time occupied in cooling down the articles, so will their character or structure be modified.

When a high degree of heat is employed, and the cooling very gradual, the casting will have a solidity and fracture nearly approximating to that of the original material; with a less degree of heat and more rapid cooling, the article will acquire a character and texture closely resembling that of marble; and with a still more rapid cooling, the products of the melted materials will be a rough semitransparent kind of glass. In all cases the cooling down should be gradual, and when pipes or cylinders are cast, the core should be removed when the material has set, to allow for its proper contraction in cooling. To facilitate the removal of the core, it may be constructed in several pieces, as is now frequently practised by casters in metal.

When the material is particularly refractory, or rapid fusion is required, it may be found necessary to employ soda, or some other material, as a flux; but, as a general practice, it is recommended to adopt the method above mentioned, and to dispense with the use of fluxes of any kind.

Claim.—The melting of the materials mentioned, and the running of them into suitable moulds to obtain castings of the same.

Improvements in presses and matting, and

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in the process of, and apparatus for treating fatty and oily matters, and in the manufacture of candles and night-lights. GEORGE FERGUSSON WILSON, manager of Price's Patent Candle Company, Vauxhall; DAVID WILSON, of Wandsworth, Esq.; JAMES CHILDS, of Putney, Esq.; and JOHN JACKSON, of Vauxhall, gentleman. Patent dated Nov. 3, 1851.

1. The *first* improvement in presses consists in employing in a hydraulic press more than one ram or plunger. The patentees describe an arrangement where two concentric rams are used. The oil cylinder occupies a vertical position in the press, and is perforated at the sides for the escape of the oil expressed during the working of the machine: the method of working is as follows: The capital or head of the press being removed, the rams are raised to the level of the top of the cylinder, and a perforated plate of metal covered with a matting of cocoa-nut fibre is placed thereon. On this is placed a certain quantity of the materials to be pressed—then another plate and mat—then more materials, and so on. While the materials are being supplied, the rams are gradually lowered by a portion of the water being allowed to escape until the cylinder is filled with the materials to be pressed. The capital of the press is then fixed on, and the pumps set to work to raise the smaller ram and consolidate the materials without exerting much pressure. The rams are then again lowered, and the capital removed, when the space produced by the consolidation of the materials in the cylinder is filled up with fresh layers, the capital again fixed on, and pressure applied to the rams until the whole of the oil or other liquid product is expressed when the exhausted materials are removed to make way for a fresh supply.

The *second* improvement in presses has relation to those hydraulic presses wherein the pressure is applied to the materials under treatment in drawers or boxes. The drawers are perforated at the sides, and each one has a block underneath of a size to fit the interior of the drawer next below it. The pressure is applied from below, and when the oil has been obtained, the drawers are lowered to their first position, and being slid out upon a frame raised for that purpose at the sides of the press-bars, are emptied by allowing the bottoms, which are hinged to the sides, to fall downwards, after which they are again charged and slid into their proper positions in the press for another operation. The process is much facilitated by having two sets of boxes, and using them successively.

2. When fatty matters are subjected to heat and pressure in cocoa-nut matting, they are found to be discolored thereby, and this advantage is proposed to be got over by the use of matting composed of Brezilian grass or fibre of the aloe leaf. The Brazilian grass is cut into shreds and plaited, and the fibres of the aloe leaf are twisted together, and worked into matting, which may be advantageously used for other purposes than that mentioned.

3. The process of lime saponification is found to be much improved if air be excluded; with this view, therefore, the patentees conduct this process in closed vessels, and introduce steam, by which the air is expelled. The steam is admitted through pipes, coiled in the bottom of the vessel, and is thus made to serve the double purpose of heating the materials under operation, and of preserving them from contact with air.

4. It is found that distilled fatty acids do not contract much, or lose bulk in cooling; and there is therefore a difficulty in withdrawing candles made from such fatty acids from their moulds when composed of metal. The patentees propose, however, to use moulds made of glass, and they wick these moulds by means of the machine known as "Morgan's." The moulds are made from glass tubes, and the ends of the tubes are blown or drawn to the shape required by the particular kind of candle to be moulded, and in order to lessen the chances of accident, the moulds are set in or supported by flexible materials, such as India rubber.

5. The product of the process of lime saponification is capable of being readily bleached by the application of sulphurous acid gas. For this purpose the soap is directed to be reduced to powder, and the gas is forced to traverse it by the action of a suitable pump. For the sake of economy, the patentees employ the sulphurous acid gas, which results from the process of "hot acid saponification."

6. The stearine of cocoa-nut oil may be profitably employed in the manufacture of candles not requiring to be snuffed by using the same in an uncombined state with wicks so plaited that while burning, they may be capable of turning out of the flame. The wicks are preferred to be made of a rather large size, and were two are used, they should be disposed so as to turn out of the flame in opposite directions

7. With a view to cheapen and improve the manufacture of night-lights, the patentees propose; *first*, to size the paper of which the boxes or cases are composed, and

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to use thin instead of thick paper, and the sizing to be effected by immersion or with a brush; *second*, to dispense with the bottom card of the box or case where wick-sustainers are used, and to fold in the paper of which the sides of the case are composed, so as to form a bottom, using size to render it firm when necessary; *third*, to ornament the cases cheaply by printing in colored ink on uncolored paper; and *fourth*, where gelatine cases are employed, to strengthen them by the introduction of threads or fibres in the course of making.

8. The patentees describe two arrangements by which the cases of night-lights may be expeditiously and effectually filled without any waste if materials.

Claims.—1. The improvement in the process described.

2. The manufacture and application of matting as described.

3. Excluding the air when saponifying and decomposing fatty and oily matters.

4. Operating on or treating saponified matters by sulphurous acid gas.

5. The moulding of candles made of distilled fatty acids in glass moulds, and the making of glass moulds and setting them in elastic materials.

6. The manufacture of candles by employing the stearine of cocoa-nut oil, combined with wicks which, in burning, turn out of the flame.

7. The means of improving and cheapening the manufacture of night-lights; also the combinations of machinery for filling several night-light cases or boxes.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

ANALYSIS OF THE FRUITS OF THE DULCAMARA.

BY M. V. LEGRIP.

THESE fruits were gathered when perfectly ripe.

Although slightly sweet to the taste, they were acrid, sharp, and of a very persistent bitterness.

They were crushed and pressed with the hand through a cloth. The grounds diluted with distilled water, were again pressed. The two runnings were mixed.

The juice thus obtained was heated to the boiling point; it furnished an abundant coagulum which was collected on a filter and set aside under the designation *F*.

The product of the filtration was acid, very limpid, of a cherry red color. It was boiled with $\frac{1}{25}$ of its weight of oxide of lead in impalpable powder. At the end of an hour, the boiling liquor was filtered, and the filtered liquor was put in a receiver plunged in water at $0° \times 80$. Cooling produced a white granular deposit.

The leaden residue on the filter was placed on one side and designated by the letter *A*.

The granular deposit in the receiver was collected and marked *B*.

These two precipitates *A* and *B* were washed in cold distilled water; the washing water, filtered, was united to the supernatant liquor of the deposit *B*. This very bitter liquid, preserved its original cherry red color; it continued acid. We designated it by the letter *C*.

The filter through which this liquid *C* had passed, was dried and exposed to heated charcoal, it burned briskly with a kind of deflagration; it diffused an odor similar to that of burnt sugar.

The liquid *C* was evaporated by steam to a syrupy consistence. This extract was introduced into a flask; alcohol at 84° was poured upon it. When it was intimately mixed, a brown matter of a gummy appearance was deposited at the bottom and sides of the vessel, which, being put aside for future investigations was ticketted *G*. The supernatant alcoholate was subjected to distillation. The alcohol obtained became slightly cloudy with water: it contained a volatile principle to be isolated; it had a slight odor and the taste of alcohol which had been distilled over animal matter. The brown residue in the retort, become aqueous by the removal of the alcohol, was preserved for other investigations under the designation *L*.

The coagulum *F*, tested by alcohol, communicated to this menstruum a light yellow coloration. It was dried with difficulty; it was pulverised and introduced into a mattrass; it was treated several times by twenty times its weight of ether; it was frequently agitated and left each time for a certain period in contact; the ethereal products were united. The color of the mass was that of tincture of saffron. The etherial

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liquors were subjected to distillation. The ether obtained had nothing remarkable about it. The extractive residue of this operation was to the coagulum : 7 : : 24. We will examine it under the designation *M*.

During the distillation there was produced in the retort, at the height of the superior layer of ether, a circular incrustation of 3 millimetres in width. This zone was a coloring matter of a fine red purple, insoluble in ether, but which alcohol will take up; it appears to be less soluble in water.

The coagulum *F*, exhausted by ether again gave a coloring matter to rectified essence of turpentine. The oleölic tincture was of a very intense yellow color; the product of the second distillation offered nothing remarkable.

The product *L* brought by evaporation by steam to the state of dry extract, was reabsorbed, half by alcohol at 94½°, the other half was subjected to the action of ether. The filtered alcohol was marked *P*, the ethereal liquor designated *T*, and the two residues of these macerations, the one designated *Q* and the other *U*, were, like the preceding products, set aside to be, each according to its nature, subjected to the reactions necessary to isolate all their constituent principles.

The result of our researches is that 1,000 grammes of unpurified solanum dulcamara contain :

	gr.
Water	783·30
Vegetable albumen	49·20
Vegetable fibre	73·60
Uncrystallisable sugar	25·25
Gum	22·00
Yellow resin	10·25
Cerine	5·50
Elaine	5·90
Stearine	1·30
Inuline	1·10
Odorous volatile oil	0·35
Solanine	3·25
Nitrate of potassa	0·75
Acetate of potassa	2.30
Malic acid, both free and combined	9·25
Yellow matter coloring the fatty bodies	1·90
Red matter, partly united with wax (polychroïle)	0·90
Brown extractive matter, coloring the sugar, gum, vegetable albumen and fibre	2·30
Vegeto-animal extractive matter	1·20
Loss	0·40

A portion of the fruits were devoted to a search for the mineral principles. The juice, dried, was subjected to incineration; analysis showed us that these principles were as follows:

Free lime and potassa.
Phosphates of lime and magnesia.
Sulphates of soda and potassa.
Copper, very appreciable.
Silica, and traces of manganese.

There is no doubt that the free lime and potassa were, in the fruit, only partly combined with the malic and acetic acids. As for the silica, we regard it as being in the fruit as an acid, forming silicates.—*Journal de Chimie Médicale*, April, 1852.

Chambon, 15th February, 1852.

CASE OF POISONING BY LAUDANUM IN INFANCY, SUCCESSFULLY TREATED BY KEEPING UP ARTIFICIAL RESPIRATION BY MEANS OF THE GALVANIC BATTERY.

BY WILLIAM BIRD HERAPATH, M.D.

(*Concluded from page* 374.)

Remarks.—The treatment of this case is most satisfactory; it shows in an eminent degree that perseverance aided by science will accomplish wonders. An infant of tender age, only thirty-nine days old, has nearly three grains of fluid opium administered to it—a decidedly fatal dose; the whole is retained and absorbed, as four hours elapse before the slightest effort is made in its behalf. It is true the nurse had wisely endeavoured to keep it awake all the time by continued agitation, but these efforts failing, it was sent to my surgery: fortunately I arrived about ten minutes afterwards, or in a few moments all would have been over. I never undertook a case with less hope to stimulate me, and soundly reprimanded the most interested parties for the unwarrantable delay which had been allowed to occur before rendering any efficient assistance to a case of such imminent danger. Slight impovement resulted from the ordinary mode of treatment; our only hope was derived from this amendment. The battery was the sheet-anchor; the other means only paved the way for its use, and gave us hope that perseverance would surmount the difficulty. Unfortunately, from its having been out of order, and no opportunity occuring to repair it, except in a temporary manner, it could not render the assistance it ought to have done, and a condition of asphyxia results, so nearly approaching to death, that the heart alone, of

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all the living wheels, continues to act, and even this goes but poorly, 30 times in a minute instead of 120. How near the grave! Yet the "sacred fire" is applied—the life-giving stream circulates with lightning rapidity through the whole spinal system, and the patient sucks in the breath of life—mechanically, it is true, but as if endowed with sense and consciousness, slowly, but surely, the function of respiration becomes re-established; the vital air not only gives new vigour to the feeble frame, but it burns away the waters of Lethe, and enables the nervous system to throw off that incubus which oppresses it to death. During eight long, tedious hours was the stream constantly employed; not a moment could be suffered to elapse without the attention being directed both to the apparatus and to the patient, or the results of all the previous care were lost, and the case endangered. But at length came the reward for all our toil: the patient could do without our aid; it could by its own energy inspire the breath of life—the universal spirit of ancient days, being as it is, both the creating and destroying agent of mundane organization.

P.S.—Since writing the remarks on the above case, I have seen, in THE LANCET of March 20, the account of the death of Mr. Lloyd's patient from chloroform, in which instance galvanism temporarily roused the subject, even after the functions of respiration and circulation had apparently ceased for ever. "The circulation appeared to return after the employment of artificial respiration and galvanism; then respiratory movements ensued without manual aid." Three times was the patient roused by the same means, yet at last relapsed irrecoverably. It would be interesting to the profession to know by what means galvanism was employed, and also through what nervous arc the current traversed the spinal system; in fact, at what parts of the body the positive and negative wires were applied.

Perhaps Mr. Lloyd will have the kindness to explain these points fully in the next LANCET. With respect to chloroform, permit me to say, that I have had considerable experience with it, in the practice of midwifery, and also in surgical operations; and having never met with a case in which serious symptoms developed themselves, I ascribe the cause to the precautions invariably used by me to avoid them. My rules are—1st. Never to administer it to any patient with a full stomach. 2ndly. To take particular care that the vapour is diluted with plenty of atmospheric air; and I invariably employ a cupped sponge, with large holes, applying but a small quantity of the liquid at one time. 3rdly. Never to proceed to stertorous respiration if it can be avoided. As soon as the patient becomes insensible to sound, or the pupils dilate, to intermit the application of the chloroform, and operate at once, if necessary, applying the sponge again and again for short periods, in order to keep up the anæsthetic effect. It is never necessary to make the patient lie like a breathing log, as I have frequently known to occur in the practice of other parties. Death from chloroform takes place in consequence of the density of the air mixed with the heavy vapor of the chloroform being nearly equal to or greater than that of the carbonic acid to be expelled from the blood. Thus, the density of carbonic acid gas at 60° is one and a half that of atmospheric air; consequently, oxygen and nitrogen endosmose through the membranes of the pulmonary air-cells and capillaries, whilst carbonic acid exosmoses through the same membranes, according to the known laws regulating endosmosis of gases—namely, "in inverse proportions to the square roots of their densities." Now, increase the density of the inspired air by adding the vapor of chloroform to it, and of course carbonic acid accumulates in the circulating fluids; it does not exosmose through the membranes at the same rate. The nearer the two densities correspond, the less carbonic acid escapes from the blood, and the function of respiration no longer goes on. An inspection of the accompanying table of the specific gravities of the following gases and vapors may contribute to the perfect comprehension of this argument:—

	Specific Gravity.
Atmospheric air at mean temperature and pressure.....	1·000
Carbonic acid	1·523
Nitrous oxide (laughing gas)..	1·520
Ethereal vapor	2·586
Chloroform vapor	4·200

Now, it follows that it is possible to respire a mixture of one volume of the vapor of ether, if it be diluted with two volumes of atmospheric air, the specific gravity of the mixture being 1·517 for $\frac{(1{\cdot}000\times2)+(1\times2{\cdot}586)}{3}$ =1·517, and one volume of the vapor of chloroform to be at all respirable, must be diluted with more than five volumes of atmospheric air, as the specific gravity of such a mixture would be 1·533 higher than carbonic acid, for $\frac{(1{\cdot}000\times5)+(1\times4{\cdot}2)}{6}$=1·533 whilst nitrous oxide having a specific gravity of 1.520, may be respired perfectly pure during a certain time, after which the access

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of oxygen gas is absolutely necessary to keep up vitality.

There is another circumstance worthy of attention. Atmospheric air at 60°, saturated with the vapor of chloroform, has a specific gravity of 1·355, and is therefore perfectly respirable; but increase the temperature of the air to 70°, and it will take up a much larger quantity of the vapor, by which means the specific gravity will be increased to 1·533. It is, therefore, necessary to pay attention to this point also, or danger will ensue. This is more especially requisite where inhalers are employed; a good cupped sponge, moistened with cold water, has numerous advantages over every variety of inhaler I have seen, the chief being, in my opinion, that the rapid evaporation of the chloroform diminishes the temperature of the air as it passes through the interstices of the sponge, thus decreasing the specific gravity of the mixed gases for respiration, and consequently adding to the safety of the patient.

There are other causes why chloroform impedes and destoys the powers of life. The local anæsthetic effect of the vapour upon the ramusculi of the pneumogastric nerves distributed on the air-cells destroys their excitability; they no longer carry that excito-motory power to the medulla oblongata, so necessary to produce the mechanical movements of the respiratory muscles to action. Again, the blood, highly charged with chloroform and carbonic acid, and deficient in oxygen, may act centrically on the medulla oblongata, destroying its nervous energy and paralyzing its functions. The most practical difficulty is that which the difference in density occasions. We have that fairly under control. The physiological difficulties may also be met by not giving the Lethatic fluid too rapidly and in too great a quantity. The respiration of the vapor of chloroform may be kept up for a considerable length of time provided it be not suffered to accumulate in the air-cells of the lungs, or in the circulating fluid, the occasional respiration of atmospheric air being permitted from time to time.

In resuscitating from an over-dose of chloroform, galvanism is the only chance. Keep up a current of electricity through the fifth nerve, medulla oblongata, phrenic nerves and diaphragm, as long as respiratory movements can be produced, and let the patient have plenty of fresh air or oxygen gas, and the case must do well, for the blood will remain fluid for a long time, and circulation will go on as long as respiration continues to be carried on artificially. The blood and the air-cells throw off their load, and in proportion as the pneumo-gastric, medulla oblongata, and motor nerves, slowly resume their functions, so respiration begins to assume a less artifical character; at length the cerebrum aids us, and respiratory movements, both voluntary and involuntary, keep up the functions of life unaided.

It is my opinion that if the stream of electricity had been employed in Mr. Lloyd's case, in the manner in which I used it with Mrs. B———'s infant—namely, by applying the positive electrode to the mucous membrane of the mouth, and the negative over the diaphragm, and so stimulating the branches and the trunk of the fifth nerve and sending the current to it by the medulla oblongata, and taking advantage of its physiological excito-motory function to induce motor phenomena through the medulla oblongata, phrenic, intercostal, and external respiratory nerves, and thus compelling the whole respiratory system to enter into a combined effort to maintain the function in its natural and physiological action,—it would have terminated as successfully as my own, provided the artificial respiration had been kept up long enogh to unload the system of the toxic and Lethiferous vapour oppressing it, as the opium did in my patient.—*Lancet.*

PREPARATIONS OF NITRATE OF SILVER.

BY M. CAZENAVE.

NITRATE OF SILVER POMMADE.

	grammes.
Nitrate of silver.....	1 to 4
Lard	30

As ointment in erysipelas.

IODIDE OF SILVER POMADE.

Iodide of silver	0·6
Lard.....	30·0

As ointment in syphilitic and scrofulous swellings.

CYANIDE OF SILVER POMADE.

Cyanide of silver.....	0·6
Lard.....	30·0

For application to syphilitic ulcerations.

These last two pommades are proposed as fulfilling the indications for which recourse is habitually had to iodide of potassium or mercurial preparations. As they are far from having been proved equally efficacious they are in general but little used.

INJECTION OF NITRATE OF SILVER.

Nitrate of silver	0·05
Distilled water.....	125·00

In injections for blennorrghia. The dose of nitrate to be gradually increased.

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CAUSTIC INJECTION. (RICORD.)

Nitrate of silver	5·0
Distilled water.....	30·0

To be employed with great care.

The use of abortive injections has now been generally given up.

NITRATE OF SILVER COSMETICS.

Nitrate of silver constitutes the foundation of most of these preparations, and tinctures more or less celebrated for darkening the hair; of the Egyptian water, etc. It is employed in all forms, in lotions, pastes or under a liquid form.

All these preparations, which are not all of them without inconvenience are more often difficult of application and uncertain in their results. The following are three of the most simple among many.

	grammes.
Nitrate of silver	4
Distilled water	30

Apply it by means of a fine comb dipped in the liquid, avoiding touching the skin with great care.

	grammes.
Nitrate of silver.....	8
Cream of tartar	8
Weak ammonia	15
Lard.....	15

Mix. Introduce this pomade into the hair by means of a comb or brush.

	grammes.
Nitrate of silver	15
Proto-nitrate of mercury ...:	15
Distilled water	125

Dissolve, filter, wash with sufficient distilled water to obtain 165 grammes of solution.

Make a slight paste with this solution and a sufficient quantity of starch. It is laid on the hair at night; the head is covered with gummed silk; on the morrow, it is washed and any kind of grease is applied.—*Annales des maladies de la peau et de la syphilis.*

HYDRO-ALCOHOLIC EXTRACT OF ERGOT OF RYE.

BY M. CH. STICKEL, PHARMACEUTIST AT KALTENNORDHEIM.

EXHAUST 8 ounces of ergot of rye in coarse powder, with an equal quantity of sulphuric ether. The oil is separated with the ether. It is allowed to digest for two days, the residue dissoved in 48 ounces of hot water, not hotter than 167° F. The decanted liquid is reduced by evaporation to one-fourth of its volume, rectified spirit of wine is added until the liquor ceases to be cloudy; it is filtered and evaporated to the consistence of honey. This product is preserved. The residue of the ergot of rye is digested during 3 days in 8 ounces of highly rectified alcohol. It is pressed and filtered; the aqueous product is then evaporated, mixed with the alcoholic extract, to the consistence of a thick extract.

The product obtained in this manner is about 1 oz. 6 drs., and offers several advantages over the preparations of ergot hitherto recommended. It is freed from the fatty oil, which is entirely without medicinal properties; it contains united all the active products which are found separately in what Wiggers, Haser, Ebers and Bonjean call ergotine; hemostatic extract, etc.: finally, as its preparation is always alike, it gives to physicians a fixed point to complete their experience, hitherto so imperfect, on the therapeutical effects of ergot of rye—*Archiv der Pharmacie.*

ON THE PREPARATION OF BENZOIC ACID BY SUBLIMATION.

BY M. J. DELAGARDE.

FLOWERS of benzoïn, prepared by simple sublimation, soon turn yellow, even when obtained by Mohr's method, which is doubtless owing to the very great quantity of essential oil which they contain.

Having had occasion to prepare some during the time that I was resident officer in the Maritime Hospital at Rochefort, I thought that by adding a certain quantity of animal charcoal to the benzoïn, this charcoal would retain at least a portion of this volatile oil, at the same time that it would give greater whiteness to the benzoïc acid obtained.

This is in reality what occurred, and the product has preserved all its whiteness during the lapse of two years.

The method of operating is very simple.

The benzoïn is reduced to a coarse powder, it is spread of a uniform thickness at the bottom of a plate iron vessel, it is then covered with a layer of animal charcoal, washed with hydrochloric acid, of half a centimetre in thickness.

To this vessel is luted, as is done by Mohr, a sheet of filtering paper; above is placed a thick paper head, exactly fitting the edge of the vessel.

The little apparatus is placed in a sand-bath, and moderately heated.

The benzoïc acid thus obtained is not chemically pure, but it is sufficiently so for ordinary purposes, and it is very white.—*Journal de Chimie Médicale.*

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VIRGIN SCAMMONY, WITH SOME REMARKS UPON THE CHARACTERISTICS OF SCAMMONY RESIN.

BY B. W. BULL.

The more extended use in medicine which this substance has acquired within a few years, and its consequent greater consumption, render the knowledge of its peculiarities and the modes of ascertaining its purity doubly important to the druggist and apothecary.

An instance occured a few weeks since, showing the necessity of careful and thorough examination of every parcel of this drug, and possessing some interest, from the fact that no description of any similar attempt at falsification has, I believe, been before published.

The commercial house with which I am connected purchased a parcel of what purported to be virgin scammony from the importer, who obtained it direct from Smyrna. A sample of it was examined and found to contain seventy per cent. of resinous matter, but when the whole lot was received it was found to consist evidently of two different grades of the article.

The whole of it was composed of amorphous pieces, possessing externally a similar appearance. Upon breaking them, however, a manifest difference was observable. Some of the pieces possessed the resinous fracture, and the other characteristics of virgin scammony, while the remainder, which constituted about five-eighths of the whole, exposed a dull, non-resinous surface when freshly broken.

I selected two samples, each possessing in the highest degree the characteristics of the two varieties, and subjected them to the action of sulphuric ether with the following results, designating the resinous or best No. 1, and the other specimen No. 2:—

	I.	II.
Specific gravity	1,143	13,935
	Per cent.	Per cent.
Resinous matter and water	94·35	49·86
Vegetable substance insoluble in ether.	3·20	45·16
Inorganic matter	2·45	4·98
	100·00	100·00

The vegetable substance in No. 2 was principally, if not entirely, farinaceous or starchy matter, of which the other contained not a trace. The result shows that this parcel of scammony was composed partly of true virgin scammony mixed with that of an inferior quality; and also indicates the necessity of examining the whole of every parcel, and of not trusting to the favorable result of the examination of a mere sample.

The powder in the two specimens was very similar in shade, and they possessed in about the same degree the odor peculiar to the substance, showing the fallacy of relying upon this as a means of judging of the comparative goodness of different samples. This fact may appear anomalous, but on different occasions the powder of No. 2 was selected as having the most decided scammony odor.

Since examining the above, I have had an opportunity of experimenting upon a portion of scammony imported from Trieste as the true Aleppo scammony, of which there are exported from Aleppo not more than from two hundred and fifty to three hundred pounds anually.

The parcel consisted of a sample of one pound only, which was obtained from a druggist of respectability in that place by one of my partners, who was assured that the sample in question was from the above source, and the kind above alluded to. This scammony was in somewhat flattish pieces, covered externally with a thin coating of chalk in which it had been rolled, the structure was uniformly compact, the color of the fracture greenish, and it possessed in a high degree the caseous odor.

The fracture was unusually sensitive to the action of moisture. By merely breathing upon a freshly exposed surface, a film resembling the bloom upon fruit was at once perceived. Its specific gravity was 1,209, which, it will be observed, approximates with unusual accuracy to that given by Pereira as the specific gravity of true scammony, viz. 1,210. It contained—

	Per cent.
Resinous matter and water	89·53
Vegetable substance insoluble in ether	7·55
Inorganic matter	2·92

There was no starchy matter present in the portion examined.

The mode of deciding upon the value or goodness of different samples of scammony, by ascertaining the amount of matter soluble in sulphuric ether, has seemed to me productive of a negative result in showing how much of non-resinous matter was present, rather than a certain method of ascertaining the actual amount of scammony resin present; but some experiments upon the resinous residuum lead to a more favorable conclusion.

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The results of the analyses made by Johnston, who seems to be the only chemist who has paid any attention to its ultimate composition, show that it varies in composition materially from any other resins.

According to his analyses, as contained in Löwig, it has the formula ..... $C_{40} H_{33} O_8$

While that of Guaiac resin is .. $C_{40} H_{23} O_{10}$

Of Colophony .... $C_{40} H_{30} O_4$

Or expressed in per cents: —

	Scammony.	Guaiac.	Colophony,
Carbon....	56·08	70·37	79·81
Hydrogen..	7·93	6·60	9·77
Oxygen ..	35·99	23 03	10·42
	100·00	100·00	100·00

The resin analysed by Johnston was obtained by evaporating the alcoholic solution, and he describes it as opaque, pale yellow, hard, and brittle; when obtained, however, by evaporating the ethereal solution I have found it transparent.

It might be inferred that, with a composition so different from that of the substances above adduced, its behaviour with reagents would be different from theirs; and its action with strong acids confirms the supposition, as may be seen by reference to the appended papers from a late number of the Paris Journal of Pharmacy.

The Edinburgh Pharmacopœia has an extract of scammony among its officinal preparations, prepared by treating scammony with proof spirit, and evaporating the solution. It is described as of a dirty greenish brown color. This color, however, is not a necessary accompaniment, but is owing either to some coloring matter being dissolved in the menstrum or to the partial oxydation of the dissolved substance under the influence of the air and the heat of the operation.

The ethereal solution of scammony resin, when gradually evaporated, and without exposure to heat, leaves a colorless or amber-colored resin, perfectly transparent and soluble in alcohol; when heated, however, during the operation, more or less insoluble matter of a dark color is found. Sometimes the ethereal solution, when spontaneously evaporated, leaves a dark residuum, but a second solution and evaporation leaves it as above described.

This product, obtained from several different parcels of virgin scammony, I have considered free from admixture with any of the substances with which scammony is said to be adulterated, and from the similarity of their behaviour, and, as the circumstances under which the sample from Trieste above alluded to was obtained are such as to make its genuineness very certain, feel warranted in so doing.

Sulphuric acid does not immediately decompose it, put produces the effect described by M. Thorel.

Nitric acid produces no discoloration, nor does hydrochloric acid immediately.

If scammony should be adulterated with colophony, sulphuric acid would be a very ready method of detection, though it would seem that this substance would hardly be resorted to, unless an entirely new mode of sophisticating the article should be adopted abroad.

The introduction of the farinaceous substances and chalk is effected while the scammony is in a soft condition, in which state it would be difficult to incorporate colophony completely with the mass.

An admixture of resin of guaiac is also detected by the same agent, a fact which seems to have escaped observation.

When brought into contact with sulphuric acid, resin of guaiac immediately assumes a deep crimson hue, and this reaction is so distinct that a proportion of not more than four or five per cent. is readily detected.

The deep red mixture of sulphuric acid with resin of guaiac becomes green when diluted with water, a remarkable change, which adds to the efficacy of the test. Scammony resin, on the contrary, suffers no alteration by dilution.

In addition, nitric acid affords a ready mode of ascertaining the presence of resin of guaiac. It is well known that nitric acid, when mixed with an alcoholic solution of guaiac, causes a deep green color, which soon passes into brown, or if the solution is dilute, into yellow.

This reaction is manifest when scammony resin is mixed with guaiac resin in the proportion above mentioned, though the greenish blue tinge is then very transcient, and sometimes not readily perceived.

Chloride of soda is a delicate test for the presence of guaiac resin. Added to an alcoholic solution, a beautiful green color appears, while it produces no effect on scammony resin. This reaction is very evident, though transient, when a very small proportion of guaiac is present. Nitrate of silver causes a blue color in a solution of guaiac resin, as does also sesquichloride of iron, neither of which agents affects the color of a solution of scammony resin. In fact, the evidences of the presence of guaiac are so numerous and distinct that there can be no possibility of an un-

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detected adulteration with this substance.

The high price of resin of jalap would seem to be sufficient to prevent its being resorted to as a means of sophisticating scammony; but in case this substance should be made use of, the method proposed for detecting it by means of ether is defective, since, according to authorities, resin of jalap is partially soluble in that substance.

It becomes of interest to know whether in the preparation of scammony the juice of the plant from which it is obtained is ever mixed with that of other plants of similar properties, or with that of plants destitute of efficacy. This information can, of course, only be furnished by those familiar with the localities and with the mode of its preparation.

In advancing the opinion that scammony should only be employed for therapeutic purposes in the state of resin, I mean that this resin should only be prepared by the apothecary himself. When, however, it is impossible for him to do so, and the commercial article is in consequence resorted to, there arises a liability to deception. We must then be enabled to recognise its purity.

To avoid detection of the fraud, the admixture must either be in small quantity, or it must possess nearly the same action. In this latter case, resin of jalap would be employed as being less in price and nearly as active.

The method I propose for detecting an adulteration of this nature, in case it should be attempted, is based on the one side upon the entire insolubility of resin of jalap in rectified sulphuric ether, and on the other, upon the solubility of scammony resin in this liquid. Nothing is easier than the detection of a mixture of these two resins, since eight grammes of ether dissolve completely ten centigrammes of scammony resin.

Thus by agitating for a short time a mixture of twenty centigrammes of suspected resin with sixteen grammes of sulphuric ether, we shall then be certain of the presence of resin of jalap, provided there is no other admixture, if a portion remains undissolved. This undissolved portion, dried and weighed, gives the proportion of the two resins.

Other more culpable sophistications may be attempted, either by the addition of resin of guaiac, or by that of colophony or other substances.

The resin of guaiac may be easily detected by means of the solution of gum, which I have specified as one of the most certain reagents (Repertoire du Pharmacien, vol. iv., 1848), or by the means of nitrous gas, or bichloride of mercury.

Many reagents disclose the presence of common resin or of pitch in the resin of scammony. First, spirits of turpentine, which dissolves the common resin at the ordinary temperature, and which leaves scammony resin almost untouched. The most certain re-agent, however, in my opinion, is sulphuric acid. This acid possesses the property of dissolving many resins—modifying their composition more or less.

Thus, if a small quantity is poured on common resin, an intense red color is produced by contact; poured on scammony resin, on the contary, it does not produce an immediate change; only after some minutes, and with exposure to the air, does it become colored, and then but feebly, with the production of a color resembling the lees of wine, while in the first case the color is a very deep scarlet.

By this method one twentieth part of colophony may be detected in scammony resin. It is sufficient to pour upon twenty-five or thirty centigrammes of resin, placed in a glass or porcelain mortar, four or five grammes of commercial sulphuric acid, and to give one or two turns of the pestle; if colophony is present, the mixture will redden immediately upon contact; if, on the contrary, it is pure, the liquid will only become colored after the lapse of some time.

Colophony being more soluble in sulphuric acid is acted upon which more rapidity."

"Scammony resin obtained by alcohol of 86 degrees occurs in form of powder or in thin transparent scales, if the alcoholic solution has been evaporated on a stove upon plates, or upon sheets of tin.

It is characterized by the peculiar odor of the substance from which it is obtained, the *odeur de brioche*, or of rancid butter.

If scammony resin has been mixed with one twentieth of common resin, trituration in a mortar developes the odor of the latter to a sufficient degree to cause detection of the fraud. Heated in a tube, a peculiar odor manifests itself with sufficient distinctness to indicate its purity.

This pure resin is soluble in all proportions in ether of 56 degrees (·752). This property affords a means of purifying it. by means of which it is obtained in thin flakes, by exposure to the air on plates.

Solution of ammonia at 24 degrees (·910) dissolves scammony resin completely. The solution has a more or less green color. These different properties, which the resin of scammony, obtained by alcohol, possesses.

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are sufficiently distinct to assist in distinguishing it from other resins or to establish its purity." *New York Journal of Pharmacy*, No. 1, January, 1852.

ON CHLOROFORM IN HYDROPHOBIA.

BY M. LE PERDRIEL, PHARMACEUTIST AT PARIS.

THE journals of Nantes and Valenciennes report two cases of hydrophobia, in which, as usual, the unfortunate patients sunk, notwithstanding all the care bestowed upon them.

It is sad to find that this frightful malady should still occur so often, and always with the same result.

It is well known that with persons attacked by hydrophobia there are premonitory symptoms, attacks which almost always present themselves: loss of appetite, melancholy, uneasiness without any cause, and fear of the least noise, always precede the attacks; when these last appear all hope is over.

If, hitherto, all efforts have failed, is that any reason why new ones should not be tried?

Cauterisation cannot always be performed immediately after the bite, and during the time which elapses between the accident and this painful operation the virus probably introduces itself into the circulation and thus renders the efficacy of cauterisation very doubtful.

Amongst all the remedies proposed in this complaint, I am not aware that the vapor of ether or of chloroform have ever been employed, and it is for you, Sir, who are more conversant with all that passes in science than I am, either to reject this letter if it has no object, or, on the contrary, to publish it in your valuable journal if you judge it worthy to attract the attention of practitioners to this question, so important to humanity.

A person attacked by an enraged animal, should be incessantly watched by his relations or surrounding friends, under the direction of a medical man.

On the least symptom of sadness of inquietude, no hesitation should be shown in subjecting the patient to the influence of the vapor of chloroform, and using it often and during several days, according to the effect produced.

The vapors of chloroform, with intervals of air, have, as you are aware, the property of slightly intoxicating and inducing a pleasant sleep; this would be probably a relief from the ordinary sadness and inquietude of the malady, and if it merely retarded the attack of hydrophobia, this delay would doubtless be an encouragement to the physician.

If, notwithstanding, the attack comes on, then the vapor of chloroform may be employed largely and fearlessly, approaching asphyxia, without quite reaching it, but retaining the patient in an intermittent state between sleeping and waking, so as to maintain life. During the waking moments the power of alimentation of the patient may be tried without letting him see the liquid offered to him, and this with a syphon; nutritious injections may be used if deglutition is impossible; finally, Sir, the physician will act, in other respects, according to circumstances, and the effect produced by the vapors of chloroform of which I recommend the trial.—*Répertoire de Pharmacie*, April, 1852.

ON THE PREPARATION OF OXYGENOUS POMADE.

ALMOST all authors recommend preparing oxygenous pomade by melting lard in a sand-bath, to which a fixed proportion of nitric acid is added when melted. This process seldom gives a fine product. In the first place it is necessary to leave the mixture of lard and acid for a very long time on the fire before bubbles of nitrous gas appear. This is the first cause of injury, especially to the beauty of the product; besides the reaction which takes place is never made in a very exact manner. The product is never of a fine yellow color, it has a greenish yellow tint, and when run into paper moulds it almost always becomes greasy.

The best manner of preparing this pomade is to pour in the nitric acid when the lard has attained a temperature of about equal to boiling water. The reaction of the acid on the axunge takes place almost immediately. It is constantly stirred; it is left some minutes on the fire, it is removed and stirred until cold: it is run into moulds of paper.

Thus prepared, this pomade is of a fine yellow color, and does not in the least grease the paper on which it is run. The transformation which the nitric acid causes in the lard is complete and the elaïdine is not the least destroyed. Many trials which I made with these two processes have always given me finer products when I operated with lard at about 212° F. than when I acted on lard melted and almost cooled again.—*Journal de Chime Médicale*, April, 1852.

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ON A MEANS OF PREVENTING INFECTION IN DISSECTING ROOMS.

BY M. SUCQUET.

A CURRENT of sulphurous acid (proceeding from sulphuric acid decomposed by sawdust) is passed through a solution of carbonate of soda (commercial salt of soda) marking 20 to 22 degrees Baumé, until all the carbonic acid has been removed and the liquid contains a slight excess of sulphurous acid. The solution should then mark 24 degrees. It is poured into a tub on to zinc filings; it should remain in contact with this metal until it has become distinctly neuter, and that the blade of a knife plunged into it may be removed without becoming brown in the air.

From 4 to 6 quarts of the liquid thus prepared are used to inject a corpse; the liquid is poured into one of the carotid arteries.

At the end of twenty-four hours the dissection may be proceeded with, and the anatomical labors may be continued without inconvenience for eight, thirty, and even forty days, according as the subject is more or less putrifiable.

All the parts removed each day should be impregnated with chloride of zinc, so as to avoid the spoiling of the surfaces exposed to the air.

When autopsy precedes the injection, the sides of the parts opened should be impregnated with chloride of zinc in a solution of 20 degrees; partial injections may then be performed, taking care to tie the veins so as to avoid the liquid flowing out through the divided ends of the veins.

It will be understood that as sulphite of soda does not cause putrifaction to retrograde, it would not have the same success on bodies in which the alteration has already advanced far.

Notwithstanding the precautions taken in the fabrication of the liquid, a difference in the sharpness of the dissecting instruments is perceived; but a slight whetting suffices to render them sharp again.

The injections of sulphite of soda suspend putrefaction sufficiently, especially during the favorable season (from the 1st October to the 1st April), to prevent the very infected emanations which have hitherto been so opposed to anatomical studies.

This means is all the more useful as the free disposal of subjects is obtained daily with more difficulty.

One of the greatest advantages of the sulphite of soda, adopted in 1846 on the report of M. Serres, consists in the influence which it exerts on the accidental wounds which operators often inflict on themselves. These wounds, often serious and sometimes even mortal in consequence of the putrid infection, rendered cauterisation necessary, which is always painful and at times insufficient; from time to time men fell victims to their devotion to their studies or to science: during the last five years, none of these fatal cases have been observed in the establishments in which sulphite of soda is used.—*Répertoire de Pharmacie*, April, 1852.

ALBUMEN AND ARSENIC.

To the Editors of THE CHEMIST.

GENTLEMEN,

In a letter, on the albumen and arsenious acid question, which appeared in the last number of your periodical, it is stated that I impugn the accuracy of Mr. Edwards' results. Now, if your correspondent will do me the favor to carefully read over the various papers and letters I have written upon this subject he will soon become conscious of the mistake he has committed; and he will also discover that the experiments he has made are merely repetitions of some which have been already published,

I remain, Gentlemen,
Yours very truly,
THORNTON J. HERAPATH.

Mansion House, Old Park,
Bristol, May 10th, 1852.

[Mr. Herapath's paper on this subject will be found at page 99 of our present volume.]

Notice.—[As we have heard of more than one instance in which books sent to us for review have not reached us, we shall feel much obliged if those who have sent us books, of which we have not acknowledged the receipt, will communicate with us on the subject.]

NOTICE.— *All Communications, Books for Review and Substance for Notice must be addressed* " To the Editors of THE CHEMIST, care of Messrs. Piper Brothers & Co., 23, Paternoster Row, London." *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following No. will in future be received as late as the 20th.*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

"CHEMICAL REPORT ON THE WATER SUPPLY OF BRISTOL."

BY THORNTON J. HERAPATH, ESQ., ASSISTANT LECTURER ON PRACTICAL CHEMISTRY IN THE BRISTOL SCHOOL OF MEDICINE, &c. &c.

THE analyses which form the subject of the present paper constitute the first of a series I have recently undertaken at my father's request. The investigation referred to includes the entire water supply of Bristol; that is to say, the water laid into the houses, that of the rivers Avon and Froome, and of the public conduits, as well as of the various wells that are resorted to by the inhabitants of our ancient city. It is in this order, and under these heads, that I purpose arranging my results in the following report:—

I.—WATER LAID INTO THE HOUSES.

1. *Analysis of the Water supplied by the Bristol Water Works Company.*

This company was established in the year 1846, and is at present the only one in existence in Bristol.* The water that supplies the works is primarily obtained from the river Chew, at Chewton Mendip, at a distance of about fifteen miles from Bristol, and at an elevation of fully 400 feet above the city. From this spot it is immediately conveyed into a covered aqueduct, and, with some supplies from other sources (the Harptree and Barrow springs, for instance), flows on to the grand reservoir at Barrow, which, it is said, is capable of holding upwards of twelve weeks' supply for Bristol. Thence it passes through a series of filters into the pipes, which convey it through the city and its suburbs. Besides the great store-reservoir at Barrow, before alluded to, three others have been constructed, as auxiliaries. One of these is situated near Bedminster; another, "the Low Service Reservoir," at the White Ladies' House; and the third,

* It was at one time proposed to supply the city from certain springs by the side of the Avon, between St. Vincent's-rocks and the Black-rock, near the Old Hotwell House. The water was to have been raised by steam-power to a tank on Windmill-hill, thence to descend through pipes to different parts of Clifton and Bristol.

Two of these spring-waters were analysed by my father and self, in 1846, with the following results:—

	A.	B.
Chloride of magnesium	1·540	1·170
Chloride of sodium	5·100	1·437
Sulphate of lime	7·950	3·012
Sulphate of soda	1·335	1·530
Nitrate of magnesia	0·700	traces
Carbonate of lime	10·500	7·000
Carbonate of magnesia	traces	5·600
Silicic acid	a little	a little
Bitumen	traces	a little
Organic mat. (nitrogenous)	a little	traces
	27·125	19·749

A. was obtained from the spring near the Black-rock.

B. was obtained from the spring at Rownham Mills.

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"the High Service Reservoir," on Durdham Down. The two former supply those parts of the city which lie on a low level; the latter supplies the more elevated portion of Clifton and Redland. Hence, it will be observed, that the whole of the city is now supplied by the constant pressure mode of service which has been so strongly recommended by the commissioners appointed by Government to report on the sanitary condition of large towns; and also that ample precautions have been taken by the company to insure a full supply of water throughout the year, even during the most protracted drought that is likely to occur.

The country which is drained by the streams flowing from Chewton Mendip into the river Chew, and from the tributary brooks above the Company's reservoirs, has been estimated by Mr. Simpson, the engineer, to exceed 8,500 acres. The underlying strata consist, for the greater part, of mountain limestone, which circumstance accounts for the comparatively large proportion of carbonate of lime contained in the water.

In order to arrive at correct results in the analysis of this water, I examined several specimens collected from different parts of the city, and at different periods of the year.

Specimen A., obtained from the service pipes on St. Michael's Hill, on August 30th, 1851. Upon analysis, a gallon of the water gave the following numbers:—

	Grains.
Chlorine	1·15697
Sulphuric acid	2·68230
Carbonic acid combined with the earthy bases	5·13920
Nitric acid	0·06246
Lime	7·85850
Magnesia	0·71061
Soda	0·41413
Potash	0·18584
Sesqui-oxide of iron	0·03333
Silicic acid	0·32000
Organic matter	1·12000

On boiling, the whole of the lime was deposited from the water, as carbonate, in the form of microscopic prisms. The precipitate so produced also contained traces of magnesia, oxide of iron, and some silicic acid.

The saline mass that was obtained by slowly evaporating the water to dryness, after the carbonate of lime, &c., had been separated by filtration, deliquesced upon exposure to moist air, in consequence of the presence of *chloride of magnesium*. When examined under the microscope, it was found to consist of at least four distinct kinds of crystals; namely, cubes (of *chloride of sodium*); prisms of different shapes, some of which were long and acicular, and readily soluble in water (*sulphate of magnesia*); whilst others, on the contrary, were short and thick, sometimes fasciculate, and but sparingly soluble in water (*sulphate of lime*); and, lastly, there were a few irregularly-formed crystals, very soluble in water, which were subsequently found, by comparative experiment, to consist either of *nitrate of magnesia* or *nitrate of lime*, most probably the former. A minute quantity of an amorphous granular powder was also observed; this, it is presumed, was a compound of either crenic or apocrenic acid with one of the earthy bases.

From these analytical results, the following composition for this water has been deduced:—

Chloride of magnesium	0·8800
Chloride of sodium	0·8283
Sulphate of potash	0·3440
Sulphate of magnesia	0·9628
Sulphate of lime	3·2000
Nitrate of magnesia	0·0856
Organic matter	1·1200
Carbonate of lime	11·3200
Carbonate of magnesia	traces
Carbonate of the protoxide of iron	0·0435
Silica	0·3200
	19·1042
Saline residue, as determined by direct experiment	19·0750

Specimen B., obtained from the feather which supplies St. Peter's Hospital, in Peter Street, on the 20th November, 1851. A gallon of the water gave, on analysis, the following numbers:—

	Grains per Gallon.
Chlorine	0·75360
Sulphuric acid	1·31040
Carbonic acid (in combination)	5·68783
Nitric acid	0·04488
Lime	7·08510
Magnesia	0·49860
Serqui-oxide of iron	0·02017
Silicic acid	0·36000
Organic matter	1·41500

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Composition of the water per gallon :—

Chloride of magnesium	0·5601
Chloride of sodium	0·5560
Sulphate of potash	0·2818
Sulphate of magnesia	0·7456
Sulphate of lime	1·1624
Nitrate of magnesia	0·0615
Organic matter	1·4150
Carbonate of lime	11·7972
Carbonate of magnesia	a little
Carbonate of protoxide of iron	0·0292
Silica	0·3600
	16.9688
Saline residue, as determined by direct experiment	16·8520

Specimen C., obtained from the Boy's School attached to Queen Elizabeth's Hospital, Brandon Hill, on November 27th, 1851. A gallon of water yielded on analysis :—

Chlorine	0·96833
Sulphuric acid	1·31650
Carbonic acid (in combination)	5·07003
Nitric acid	0·05115
Lime	6·89995
Magnesia	0·59327
Soda	0·35325
Potash	0·15750
Sesqui-oxide of iron	0·02076
Silicic acid	0·40100
Organic matter	1·39050

Composition of the water per gallon :—

Chloride of magnesium	0·7259
Chloride of sodium	0·7065
Sulphate of potash	0·2915
Sulphate of magnesia	0.8156
Sulphate of lime	1.0860
Nitrate of magnesia	0·0701
Organic matter	1.3905
Carbonate of lime	11.5228
Carbonate of magnesia	a little
Carbonate of the protoxide of iron	0.0301
Silica	0.4010
	17·0400
Saline residue, as determined by direct experiment	17·1540

Specimen D., obtained from a private dwelling-house, at Redland, near Durdham Down, on December 3rd, 1851. A gallon of the water gave, on boiling, a precipitate of carbonate of lime, which weighed 11·48 grs. The filtrate, on evaporation to dryness, left a residue amounting to 6.28 grs., which, when subjected to analysis, was found to contain 1.422 grs. of sulphuric acid and 0.423 grs. of magnesia.

From the preceding analyses, it appears that the mean composition of the Company's water may be stated as follows :—

	Grains per Gallon.
Chloride of magnesium	0·7220
Chloride of sodium	0·6969
Sulphate of potash	0·3058
Sulphate of magnesia	0·8413
Sulphate of lime	1·8161
Nitrate of magnesia	0·0784
Organic matter	1·3085
Carbonate of lime	11·5467
Carbonate of magnesia	traces
Carbonate of iron	0·0343
Silicic acid	0·3603
	17·7103

As regards the action of Clarke's soap-test on the water, I have found the hardness of different specimens, collected at different times of the year, to vary from 12.6 to 14.3 degrees. On boiling, however, the hardness of the water is much lowered. The permanent hardness is rarely more than 1.5° to 1.75°.

II.—Jacob's Wells.

From Jacob's Wells, on the side of Brandon-hill, two services of pipes proceed, one of which, belonging to the Corporation, supplies the grammar-school and one or two other places; whilst the other, belonging to the Dean and Chapter, supplies the premises attached to the cathedral, a part of College-green, Trinity Street, and two or three places adjacent.

A sample of this water obtained from one of the houses in College-green, on the 1st of January, 1852, gave the following results :—

	Grains per Gallon.
Chlorine	8·2673
Sulphuric acid	5·5247
Carbonic acid (in combination)	8·1246
Nitric acid	2.2002
Lime	15·4174
Magnesia	1·7429
Soda	4·0378
Potash	0.6491
Sesqui-oxide of iron	traces
Silicic acid	0·1890
Organic matter	2·0010

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Numbers which are equivalent to :—

	Grains per Gallon.
Chloride of calcium .	3·5840
Chloride of magnesium	1·2288
Chloride of sodium .	7·5711
Chloride of potassium	1·0400
Sulphate of lime .	9·3920
Nitrate of magnesia .	3·0151
Organic matter .	2·0010
Carbonate of lime .	17·4254
Carbonate of magnesia	0·8736
Carbonate of iron .	traces
Silica . .	0·1890
	46·3200

This water, as compared with the well-waters of the city, is of good quality; but it is much harder than that of the water-works.

The hardness of this specimen was not determined, but that of two others taken from the wells on Brandon Hill, at another period was found to vary from 25 to 26½ degrees.

III.—Sion Spring and Richmond Spring.

These springs at one time supplied many of the houses in Clifton. They take their source from the mountain limestone.

My father analysed them many years ago, and found the former to contain 60·46 grains,* and the latter 43·18 grains, of saline and earthy matters per gallon.

They are both very hard, in consequence of the presence of much carbonate and sulphate of lime.

(To be continued.)

Mansion House, Old Park,
Bristol, May 20, 1852.

EIGHTH COMMUNICATION ON THE BATTERY.

BY M. C. DESPRETZ.

OBSERVATIONS ON CONSTANT BATTERIES.

I. I will first call to mind that, in the last memoir which I had the honor of reading before the Academy, I sought to find the relation, in a battery with two liquids, between the interior working and the exterior working. The slight difference in favor of the interior working, which frequently amounted to only $\frac{1}{150}$ or $\frac{1}{200}$, or even only $\frac{1}{250}$, must be neglected in such a subject; it may, moreover, be explained by slight derivations, by the solution of a small quantity of gas, and by the inefficacious passage of a very small portion of electricity through the voltameter. As regards the reaction of the two liquids employed in Daniell's and Bunsen's batteries, we have ascertained that it is nearly nothing compared with the total effect.

It also results from these researches that a battery produces exterior working only in as much as an equivalent working occurs in its interior, so that the investigation of an energetic and not very alterable battery is a chimerical investigation. If a battery continues in operation for a long time, as in telegraphic lines, or in some particular establishments, it is on account of the great resistance of the total circuit which the electricity has to pass through, the external working is very slight, and, consequently, the internal chemical actions are also very feeble. It appears to us equally superfluous to wish to find in the battery an economical means of preparing hydrogen gas. The cost of this gas would always be higher than that of the gas obtained by chemical reactions alone.

We think we may say as much of the hydrogen gas and oxygen gas collected, unless it be desired to obtain these gases in a state of great purity. The experiments on the electric light, the principal results of which I have presented to the Academy, contain useful data concerning the question of lighting. I will reunite them in some new experiments, and shall have the honor of laying them before the Academy.

II. I come to the memoir which forms the subject of this lecture. In many of the communications read before the Academy, I have availed myself of the compass. I have announced, moreover, that I intended to repeat several of my researches, by introducing the compass into the circuit. It was in a previous study of this rheometer, and of the law of currents, that I had an opportunity of making some observations on the batteries with two liquids, with regard to their constancy.

OBSERVATIONS ON THE BATTERIES CALLED CONSTANT-CURRENT BATTERIES.

III. The batteries most commonly employed in France, since the invention of constant-current batteries, are those of Daniell, Grove, and Bunsen.

* Sion Spring is supposed to be derived from the same source as the Hotwell water. The temperature of both is the same, and the salts they hold in solution appear to be nearly similar.

[For an account of my father's analysis of the Hotwell water, see Phil. Mag., vol. xxiv. (third series), p. 371.]

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I have particularly studied the first and third of these; these two instruments have served in the various experiments which I have had the honour of submitting to the Academy. (For the former experiments of M. Despretz, see THE CHEMIST, New Series, vol. I, 1849-50, pp. 195, 239, 296, 383, vol. II, 1850-51, p. 49, and vol. III, 1851-52, p. 1.)

I have clearly perceived, both by measuring the length of the voltaïc arc in different arrangements of the battery, and by comparing, at different times, the external with the internal working, variations which Daniell's and Bunsen's batteries undergo in their intensity while they are in action; but it is only by means of a suitably-arranged rheometer that we can attain to a clear and complete idea of this phenomenon. We may confine ourselves to saying, in the various works published in France, and in those published abroad which are known to us, that the amalgamated zinc of Daniell's battery is immersed in a solution of common salt, or sulphate of zinc, or in dilute sulphuric acid, and that the amalgamated zinc of Bunsen's battery is in contact with this latter liquid. I do not speak of the exterior liquid, it is perfectly determined in both batteries. These directions have too little precision, and are totally insufficient, in our opinion at least, to give, even to a practised physicist, the certain means of fitting up, without repeated failures, a rather energetic battery presenting sufficient constancy for verifying, denying, or establishing a general fact, in which the relation of the intensities corresponding to two different lengths of the circuit performs any part whatever.

We have just said that the directions given by authors are insufficient; indeed, as a great number of experiments have proved to us, a Daniell's battery, charged with sulphate of copper and a solution of common salt, is not always constant; it is even very slightly so with diaphragms of polished porcelain, when the temperature is below 52° to 54° F., and when this solution contains one part of salt to five parts of water by weight, which corresponds to very nearly half saturation.

The experiments, of which we now report the principal results, have occupied us a long time, and have caused us to lose much time; and it is especially to save those who may work at the same subject the multiplied failures through which we have struggled, that we decide on the present publication.

We are far from thinking that no physicists, and, in particular, the two members of the Section of Physics, who have worked so much at galvanic electricity, have not had nearly constant batteries, even during weather sufficing for experiments of measure. We are persuaded that men who devote themselves to the reproduction of medals or other objects by the galvanoplastic art, must fit up their batteries so that they shall not suffer too much variation, although the galvanoplastic art does not require the degree of constancy indispensable in certain physical investigations.

We may also say that we have seen at M. Hulot's, mentioned in our preceding memoir (see *The Chemist*, vol. III, p. 1), batteries which continued with all the regularity required in the art cultivated with so much success by the skilful assistant engraver to the Mint; but, as we have not read or obtained any part of the circumstantial details which the arrangement of constant batteries requires, we have thought it useful to publish the facts observed by us. We venture, moreover, to think that this publication will not be entirely fruitless in ulterior researches.

IV. We have made a great number of experiments. We give a certain number of them in our memoir, but shall only mention some of these in this extract.

In all these experiments of which we now speak, the elements were placed in one or more zinc cases, containing water at a known temperature. The number of elements varied from 1 to 30.

The following experiment, made at the temperature of 50° F., with a single element charged in the ordinary manner, with the solution of common salt* indicated, is well adapted for showing the progress of the variation:—

In three hours during which it was in action, it gave:—

h. m.	° ′	h. m.	° ′
At 11·15	1·30	At 1·25	12·14
11·30	4·30	1·32	10·12
11·45	8·48	1·42	9·15
12·00	11.24	1·54	5·15
12·33	11·45	2·02	3·45
12·44	11·52	2·07	2·00
1·00	11·58	2·15	1·30

Other isolated elements—elements arranged for quantity or for intensity—acted in the same manner.

* Charged with common salt, or any other substance, is an abridged expression: it signifies that the common salt, or other substance, is in the porous vessel. There is always a saturated solution of sulphate of copper in the exterior vessel; in the contrary case, we shall say so.

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If, in a Daniell's battery, so weakened as to mark only one or two degrees of the compass 2,* the solution of salt and the amalgamated zinc be changed, its energy is not restored; if, on the contrary, the porous vessel be changed, leaving the zinc and the same solution of salt, the battery resumes all its force, which proves that the weakening arises from the porous vessels becoming incrusted.

The salt employed in the experiments was the grey salt of commerce. For this grey salt was substituted salt of the South of France, which is almost pure. The battery was not more constant. Finally, we took pure sulphate of copper, pure salt, and vessels previously well cleaned,† and then immersed for twenty-four hours in distilled water: the battery was as variable as with the sulphate of copper and salt of commerce. Thus, the presence of iron in the former salt and of chloride of magnesium in the latter, is not the cause of the incrustation of the pots, and, consequently, of the weakening of the battery.

V. The battery was rendered rather more energetic, but not less variable, by adding to the saturated sulphate of copper a small quantity of sulphuric acid, about half a hundredth in bulk.

VI. The solution of common salt in five parts of water was replaced by more or less dilute sulphuric acid: the battery was still not constant. An element charged with sulphuric acid diluted with nine volumes of water, marked 2° 30′ at 11h. 42m. at the moment it was mounted. The intensity gradually increased until 1h. 6m., when it was 31° 6′; it then gradually decreased until 4h. 15m., when it was not more than 21° 30′.

The weakening of this battery was regular: the porous vessel was not incrusted.

VII. The battery charged with a saturated solution of sulphate of zinc, diluted with more or less water, is almost constant, but has very little energy.

When these batteries have been kept in action for a certain time, it is found that the level in the porous vessel has lowered in proportion to the length of time the experiment has lasted.

In Daniells', Grove's, and Bunsen's batteries, the level of the liquor containing the zinc always decreases more or less; but in none is the effect more marked than in Daniells' battery charged with sulphate of zinc.*

VIII. We have seen that a battery charged with a solution formed of one part of common salt and five parts of water by weight, does not present any constancy at temperatures below 54° F.

An element charged with this solution diluted with its own volume of water, changed only a quarter of a degree in five hours.

The temperature was only 53° F.; the same constancy was observed at low temperatures.

Although the experiment lasted 22 hours, the liquor containing the zinc was colorless: no copper was found in it.

Here also there was no incrustation. To restore energy to the element, it was sufficient to change the zinc and the solution of salt.

Ten, twenty, or thirty elements, united pole to pole, or for quantity, preserve a perceptible constant intensity with the feeble resistance of the compass, and of a metallic circuit which represents at the most twice the resistance of a single element.

It will be remembered that M. Pouillet employed common salt and sulphate of zinc for charging Daniell's battery in his important work on the laws of currents.

IX. We will detail an experiment which shows very well the influence of the resistance of porous vessels.

An element of nearly twice the dimensions of those of the foregoing, and charged in the same manner, but whose porous vessel was considerably thicker (about double), gave an intensity scarcely equal to that of the small element.

These large elements present, however, an advantage which may be valuable in certain experiments: they preserve an almost constant intensity for a very long time.

After twenty-four hours this element still marked $12°\frac{1}{8}$; after forty-eight hours, $10°\frac{27}{78}$; after 115 hours, 8°; the level of the liquid had lowered considerably.

* The needle of this compass is placed on a pivot; it is forty millimetres in length. The diameter of the circle of the current is 400 millimetres.

† To clean the porous vessels, they are steeped for a night in water slightly acidulated with sulphuric and nitric acids; they are then put into water for two days, and the water is changed seven or eight times.

* This agrees with the analysis of the sulphate of copper. After the battery charged with pure salt has been in action for a certain time, a much greater proportion of sulphate of zinc than of common salt is found in it. We detail this analysis in the memoir. Being very much occupied with these experiments, we solicited a chemist well known to the Academy, M. Germain Barruel, to be kind enough to do it for us.

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X. The battery charged with a solution of sulphate of soda, dissolved in about ten parts of water, is very constant; one element did not vary one degree in forty-eight hours.

This battery is even more constant than that charged with the dilute solution of common salt, but it has only half the energy.

We substituted sulphate of soda for common salt, in order to see if the incrustation of the porous vessels would be manifested more quickly than in the experiments made with the first salt. The incrustation did not take place. There might have been produced here a phenomenon analogous to that which the stones affected by frost present.

XI. We have, in the same idea, substituted the chloride for the sulphate of copper. The solution of common salt in five parts of water, which incrusted the porous vessels with the first salt, did not do so with the second. The battery was almost completely constant throughout the duration of the experiment, which was about five hours.

This battery, which is more energetic than that, with sulphate of copper would be very good, but it can scarcely be employed on account of the high price of the chloride of copper.

XII. We also arranged some elements with bags made of sail-cloth, which had been in use for some years. M. Becquerel, in his work, ranks sail-cloth bags among the best diaphragms.

An element charged with the solution of common salt, which incrusted the porous vessels in a very short time, remained constant with this solution, as well as with sulphate of zinc.

A battery thus arranged has much more power than one of the same dimensions fitted up with porous vessels.

XIII. Some experiments on Bunsen's battery naturally entered into our programme.

We charged this battery with sulphuric acid variously diluted with water: it was never constant.

An element charged with sulphuric acid diluted with nine parts of water marked 59½ degrees at twelve o'clock, the moment it was put in operation; then it regularly lowered until 4h. 20m., at which time it marked only 26° 45′. This element soon returned to its original intensity, when the zinc and sulphuric acid were changed, whence it follows that the porous vessel does not become incrusted in this battery.

It was observed, in employing this battery in some experiments on resistance, that an interruption of a few minutes in the current augments the intensity more than a degree, when that intensity is expressed by 30°.

It is an almost general fact, that any battery acquires an appreciable increase of intensity from the momentary rupture of the circuit; the phenomenon, which is the result of the dissolving of the salt formed on the surface of the positive metal (zinc in most batteries), is so much the more marked as the battery is more energetic; Bunsen's battery shows it in the highest degree.

Whilst a battery is in operation, if it is rather powerful, all the sulphate of zinc which is formed is not dissolved in proportion, or it envelopes the zinc with a layer which is a bad conductor. During the interruption the sulphate is dissolved. Hence the increase of intensity. This coating of the metal attacked performs a part in many circumstances, and it does not appear to have attracted much attention. A friend of mine, M. Gauguin, had remarked in unpublished experiments, the phenomenon of the increase of intensity at the moment of interruption, and explained it as we have done.

OF THE OSCILLATIONS OF THE BATTERY.

XIV. These oscillations occur under peculiar circumstances.

It very often happens, as in the following experiment, that the intensity of a battery presents first a maximum, then a minimum, and finally, an intermediate intensity, which remains more or less.

Four elements of Daniell's battery were arranged for quantity, the porous vessels were filled with a scarcely saturated solution of sulphate of zinc, containing one-tenth of sulphuric acid in volume. This battery immediately gave 49 degrees of the compass; it fell to 20° in six minutes, and then rose to 35½° in six minutes more.

The current was broken for six minutes, and formed again: it was immediately found to mark 49 degrees, falling to 17½°, and rising again to 34½°.

The resistance of the compass and of the wires which put it in communication with the battery, is merely that of a wire 1½ metre in length and 1 millimetre in diameter.

In augmenting the circuit by ten metres of copper wire one millimetre in diameter, the oscillations still occur, but with less amplitude: they disappear with twenty, forty, or sixty metres added to the original circuit.

A Bunsen's element, charged with sulphuric acid diluted with five volumes of water, gave with the compass:—

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h.m.	° ′
At 3.40	53·30 as soon as it was mounted.
2·53	53. 0
3. 8	55·54

3·32 oscillations between 54° and 54½°.

The circuit was increased by forty metres of the wire already employed, and we found:

h. m.	° ′
At 3·45	16·40
4· 0	16·20
4·20	15·48
5· 0	14·48
7·30	13·45

It is easy to see, from this and similar other experiments, that Bunsen's battery, weakened by additional resistance to such an extent as to have no more intensity than Daniell's battery charged with common salt dissolved in ten parts of water, would not have its constancy.

In another experiment, two Bunsen's elements charged with sulphuric acid diluted with seventy times its bulk of water, and arranged for quantity, presented a very strange course. At twelve o'clock, the intensity was expressed by 43° 30′; this intensity, which was 31° 20′ at 12h. 42m., fell to 25° 20′ at 1h. 52m., and then rose gradually to 29° 45′ at 2h. 19m., then fell to 28° 54′ at 2h. 33m., and then resumed its ascensional course until 7h. 30m., when it marked 32° 30′. If the element had been examined only at 12h. 42m., and at 5 o'clock, it would have been thought that Bunsen's battery charged with very dilute sulphuric acid is not very variable, whereas, in reality, it is extremely so, and the course of its variations is very irregular.

The explanation of the first facts is very simple. It enters into the explanation of the increase of intensity after interruption. At the moment of closing the circuit, the entire surface of the zinc is active, the current possesses all its intensity; but very soon the sulphate of zinc, not dissolving so quickly as it is produced, covers the zinc more or less with a sort of a very bad inductor, and, consequently, the intensity of the current must gradually diminish and attain its minimum deviation. The quantity of sulphate formed being then less than that which can be dissolved, the intensity must augment until the period when a sort of equilibrium is established between the sulphate formed and the sulphate dissolved in a given time: the intensity is then constant. It may also readily be conceived why the interruption of the current, for a few seconds, does not cause the maximum deviation to reappear—a few seconds being insufficient to dissolve the salt which covers the zinc; so also we comprehend that by weakening the chemical action in the first and second experiment, the oscillations are made to disappear. The oscillations of the third experiment are explained in the same manner.

Oscillations are observed with every battery: when they are so slight as to escape the notice of the observer, they may be the source of serious errors.

XV. We have made a multitude of experiments, in studying the cause which determines the incrustation of porous vessels. Space does not admit of our detailing them here; they are given in full in our memoir.

XVI. To sum up:

1. If we understand by a constant battery a battery which continues in action one or several days, retaining a certain power, all the batteries with two liquids, and especially Daniell's battery, with its various modifications, are nearly in this position, provided that the external resistance be rendered sufficiently great to weaken the intensity, and, consequently, the internal chemical working.

2. If, on the contrary, we regard as constant batteries those which change only a quarter of a degree or even less in an hour, by a compass whose circle is from 35 to 45 centimetres in diameter, the nitric acid batteries of Grove and Bunsen must be excluded. Daniell's battery is the only one which can be regarded as being constant when it is charged as we have indicated in this memoir. We do not speak of other arrangements of the battery, as we have not studied them.

3. The cause of the want of constancy of Daniell's battery, when the solution of common salt is not properly diluted, resides particularly in the incrustation of the porous vessels.

The incrusting matter derives its elements from the sulphate of copper and common salt, as demonstrated in this memoir.

4. Common salt, sulphate of soda, and sulphate of zinc, dissolved in certain proportions in water, are the matters which appear to us best adapted for rendering Daniell's battery constant.—See the experiments mentioned.

5. The battery with two liquids almost always presents oscillations against which we cannot too carefully guard in many researches.

6. Even a constant battery must always be put in action for a certain time before using it in experiments of measurement.—*Comptes Rendus*, No. 20, May 17, 1852.

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BIOGRAPHY OF VAN HELMONT.

BY M. CAP.

(*Concluded from page* 405.)

BUT the labors of Van Helmont in physics and chemistry were not confined to the study of gases. In order to show the difference which exists between air and steam, he made experiments on the compressibility and refrigeration of each, which means are those still employed for distinguishing gases from vapors. In studying the measure of heat, he was the first who established as fixed points the melting point of ice and the boiling point of water. Beyond the boiling point of water, he took as terms of comparison the sublimation of sulphur and the fusion of pyrites: he distinguished very well between dull red, bright red, and white heat. He remarked that subterranean waters are so much the warmer as they are taken from a greater depth. He shows that common salt dissolved in water, and silver dissolved in aqua fortis lose nothing of their essence and are not destroyed. He explains the precipitation of silica from the solution of silicious stones, when an acid is added, by the *saturation* (this is the term he employs)* of the alkali in which it was dissolved. On this occasion, he also uses for the first time the expression *elective affinity*, which has likewise continued in chemical language. It was also by means of the balance that he determined the quantity of silica contained in glass.† In organic chemistry, he examined the reaction of the air on blood, and of blood on the air. He knew the acid contained in the stomach of birds and its solvent property. He studied the nature of the bile. He called fermentation the mother of the transmutation of bodies, and he remarks that it is produced in vegetable juices only in contact with the air. We still employ his expression, *digestive fermentation;* and his *fermentum digestivum*, to the excess of which he attributes rheumatisms and palpitation, is no other than our gastric juice or pepsine.

As the researches of Van Helmont always had the object of application to medicine, he could not fail to make some progress in the pharmaceutical art. To him, indeed, we owe the oil of sulphur per campanum,* first called spirit of sulphur, a laudanum analagous to that of Paracelsus, spirit of hartshorn, an oily volatile salt, spirit of human blood, the liquor of flints—a solution of silica in an excess of alkali. The *offa Helmontii* was a mixture of spirit of urine and spirit of wine (ammoniacal alcohol). Van Helmont was acquainted with the concentration of wines by freezing, and the refining of sugar by means of lime and clay; he speaks of vegetable aroma and of some other proximate principles. He introduced useful reforms into the practice of pharmacy; he proscribed boluses, powders, syrups, pharmaceutical electuaries, and all the preparations which contain small proportions of active matters in a great bulk. He accorded much confidence to mineral medicaments, to antimonial and mercurial preparations, as well as to the employment of sulphur. He noticed the influence of the temperature in the action of water on vegetable substances. He first distinguished maceration from infusion and decoction; and showed that the infusion is most charged with volatile and aromatic principles. The pioneer of the chemists of the end of the seventeenth century, he devoted himself to immense researches on the analysis by fire of fossils, of vegetables, and of animal products. Unfortunately, like them, he confounded combustion with distillation, and it is astonishing that the smallness of his success did not deter Charas, Duclos, Boulduc, and, above all, Boerhaave, from the vain labors which these chemists afterwards undertoook with the same views.

The medical doctrines of Van Helmont have been so skilfully displayed and investigated by the men of science above mentioned, that it will be sufficient for us to recapitulate their principal points, at least so far as regards the physical sciences. After having, in his book, *On the errors of the Humoristic School*† dealt vigorous blows to the doctrine of Galen, and thoroughly undermined the Arab theories of medicine, Van Helmont strove to substitute for them a physiological system, the first idea of which he derived from the Archee of Basil

* *Quae* saturando *alkali sufficit, immuta persistit.*

† *Inveniet statim in fundo arenam sidere eodem pondere quæ prius faciendo vitro aptatur.*

* Oil of sulphur *per campanum* was prepared by burning bruised sulphur in a crucible, over which was suspended a bell glass, arranged in the form of a still head, and previously exposed to the vapor of hot water, so as to moisten its internal surface. The liquid collected by the beak of this glass was no other than sulphurous acid.

† *Scholarum humoristarum passive deceptio atque ignorantia.* (Ort. Med. Amstel. 1652, p. 289).

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Valentine and Paracelsus. This word (ο αρχη beginning) represented an immaterial general principle, which presided over all the functions of organised bodies. Besides the principal archee which regulated the entire organism, he admitted the existence of several secondary archees, charged, each in its organ, with the fulfilment of particular functions, all, however, under the influence of the principal archee. This hierarchy of subaltern archees were called *Blas*. Health resulted from their harmony, and diseases from the disturbance which may exist among them. Van Helmont describes the system in detail, as if he were treating of a positive theory, and in a style often picturesque and poetical; but he often allows himself to be dazzled by his own metaphors, so that the reader is more struck with the originality of his ideas, than convinced by their accuracy.

Beside the archees, Van Helmont placed the *ferments*. He thus designated every body capable of converting another into its own substance, and whose action gives rise to the motion of fermentation. It is the ferment which communicates the impulsion to the archee, for the latter slumbers in bodies as the plant does in the seed. There exists an universal ferment, or neutral being, created from the origin of the world, indestructible, situated external to organised beings, which acts on the archee placed in their interior, and communicates motion to it. Under the principal ferment are secondary ferments, as numerous as the special archees and as the species of organised bodies; consequently, each species is found to be formed of water, the material, only, element, modified in its forms by the archees, and which, animated by the ferments, becomes capable of producing germs. Van Helmont, as is evident, was the declared partisan of spontaneous generation.

This conception, as vast as strange, seems scarcely to merit the name of system, for it is not founded on any material fact, nor on any experimental data capable of confirming it. However there was in it a primordial idea which made its way, which penetrated even into modern science, and which applies to a certain extent to the whole of natural phenomena. Thus, this principal archee of vegetables, which he called *Lefas*, is no other than the force which presides over all the acts of vegetable physiology. Another archee, *Bur*, which presided over metallisation, does not differ considerably from affinity, which gives rise to the combinations of mineral chemistry. Does not the third, which regulated, according to him, the system and the motion of celestial bodies, present the first germ of the vortices of Descartes, or even of the Newtonian attraction? and, as regards the archee of animals, which he called *Aura vitalis*, does it differ much from the physiological force of the vital principle, now generally admitted by modern physiologists?

This latter idea is that to which Van Helmont attached most importance, and from which the physician has derived the greatest advantage. He placed the seat of this archee in the cardiac orifice which he called the *porter of the Stomach (janitor stomachi)*, thus proclaiming the supremacy of the epigastric forces, the preeminence which the stomach exercises over the other organs, and that of digestion over all the physiological functions. He explained this influence, less by the structure of the organs which are subject to it, than by their own sensibility, determined by their peculiar archees. Pushing the generalisation still further, he remarked that most fevers originated in the stomach and small intestines, an idea which in our days, has resumed great favor, and which gave rise to a celebrated system of which it formed the principal basis.

It is evident that this part of Van Helmont's doctrine rested on actual observations in the practice of medicine; others are based on *sound* researches of experimental physiology. Thus, he devoted himself to consecutive studies concerning the blood, the digestion, the phenomena of respiration, and of cutaneous inhalation. He disapproved of phlebotomy, as well as of evacuants, as weakening the whole system, disturbing the archee in its reparatory efforts, and preventing favorable crises from being manifested. He says that it is the influence of a gas which causes the arteries to contract, which excites the nervous power, which developes the intelligence, and he calls it *vital air*, without confounding it, however, with that which he extracted from saltpetre. The law of organic sensibility, which he designates by the expression *intelligent blas*, did not escape his sagacity. All these doctrines, subsequently purified in the crucible of experimental philosophy, led the way to more satisfactory explanations of the phenomena of life, and form the precious links in the chain which unites the ideas of his age with those which have prevailed in the science of our days.

We may add that there is even in his theory of ferments, a fecundity of thought of which modern science has not failed to avail itself. The ferment acts on bodies

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without being altered itself; it is the yeast which determines in the paste the fermentative movement, with its reactions and its tumultuous phenomena; these are the external agents which act on all natural bodies—a new, distinct system, differing from all that preceded it, and which bore the impress of his original and inventive mind. It would not be difficult to see in it also a striking analogy with the influence which the moderns attribute to the imponderable fluids—caloric, light, electricity, magnetism,—on all natural phenomena. Preoccupied as he was with these invisible and incoercible bodies, of which, however, he noticed the properties very appreciable by our senses, it is not astonishing that his imagination multiplied them beyond measure, and attributed to them a thousand different employments. Whence his theories relative to souls, to forms, to the stars, and to their influence on terrestrial bodies; his tendencies to demonology, divination, the interpretation of dreams—ideas which were affected at once by the errors admitted by his age, by the fecundity of his mind, and by the sincerity of his convictions.

Placed at the end of the sixteenth and commencement of the seventeenth centuries Van Helmont forms the transition point between the mystical chemists and the rational chemists who have since taken possession of the science, and have established it on a higher and more solid foundation. He is the last representative of the Alexandrian method, the last adept of the school of Cardan, Sylvius, and Paracelsus; he closes, in a word, the alchemical period, and commences that of serious science, of which, from the period of his works, the progressive march had been without halt. It is this which gives to this point of scientific history a very special interest, and which explains the numerous studies of which this period has been the subject.

We cannot but admire the scientific men of this great period, obliged, from the absence of well proved facts, to avail themselves of the *à priori* method, torturing their mind to outstrip the soarings of the principles which experimental researches were afterwards to reveal, and sometimes putting forth, by high flights of imagination, the germs of theories which should very soon rule over science. Geniuses full of boldness, eager to shake off the yoke of antiquated traditions, sublime even when they imagined only errors, it is to them, it must be acknowledged, that we are indebted for those bold thoughts which put their successors in the way of greater discoveries. Their conceptions, often strange, sometimes fertile, plucked by the powers of meditation from the depths of human thought, their instinctive previsions, *anticipationes mentis* as Bacon calls them, evidently would have advanced knowledge had they only awakened controversy. But they left also happy traces which served to mark the road, and glimpses of light which served to dissipate its obscurity. The ideal, it has been said, is sometimes only truth at a distance; a well conceived hypothesis is often only the presentiment of a principle shortly to be established in science; it is the truth of the eve, as experience is that of the morrow.

Doubt, mistrust of self, began to take possession everywhere of scientific men of integrity. It was the dominant idea, in the better minds, that all knowledge had to be revised, and that it was necessary to break completely with the past, in order to establish human knowledge on new foundations. Bacon had taken as a device these words: "*Instaurio facienda ab imis fundamentis*," and that was conceived in an age in which no other argument could be found to bring against Galileo, who asserted the rotation of the earth, than this apothegm, the meaning of which was perverted: "*Terra autem, in eternum stabit, quia in eternum stat.*" We can comprehend this general desire of good minds when we see how much credit scholastic divinity still had in the schools. Van Helmont says that when he was charged with the course of surgery in the University, he was commissioned to teach that which he did not himself know. He relates,* that having asked of a doctor of Louvain why he did not seek a chair in the University, the latter replied: "It is compulsory to teach according to Galen; now, I should knowingly damn my soul, if I taught bad principles when I knew better." It is also known that having, in a fit of anger with the same doctrines, given his library to some students, he repented, and declared that he would have done better had he burned it.

But another impulse also animated Van Helmont. He thought himself called by the Divine will to the mission of regenerating the medical sciences,† and he says that this vocation was revealed to him during a sleep or rather an extacy; as Descartes, in a dream, conceived the plan of his analytical method. Van Helmont, nurtured by the reading of the alchemists, endowed with an

* *De Lithiasi.*

† *Et visus sum mihi novus medicinæ autctor, hactenus duntaxat nomine cognitæ* (*Ort. meeicinæ.*)

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enthusiastic religious character, naturally inclined to paradox and to fantastical ideas, could but communicate to his conceptions the impress of his habitual dispositions. It was at this period that he conceived the project of taking up philosophy at its beginning (*ab ovo*); but it was later that he devised the system of archees and ferments, to which he subjected not only human physiology, but all natural phenomena. Also, after having displayed as much imagination as skill in his struggle with former systems, and which he calls "the idiotism of the schools," he shows timidity and hesitation when it is necessary to substitute another theory. He envelopes his ideas in an allegorical form which announces uncertainty; he gives to his most important work the title of *Ortus medicinæ*, the commencement, the birth of medicine. "Perhaps," adds he, "I am only a bell intended to invite the faithful, myself remaining without the sanctuary."

Van Helmont anticipated by two centuries the knowledge of his age, in regard to fire, the air, gases, the earth and water. He distinguished light from heat very well; he had a true prevision of the influence of imponderable fluids in natural phenomena. He was the first who studied organic chemistry, and introduced the balance into experiments of this order. He determined the nature of flame; he was the creator of pneumatic chemistry. His works are the starting point of the study of gases, a study whose progress, retarded for some time by the advent of the system of Stahl, did not the less lead to the beautiful discoveries of Priestley, Scheele and Lavoisier.

He does not hold a less important place in the history of medicine. After having successfully combatted Galenism and humorism Van Helmont introduced into the science the system of ferments and of chemical forces. His researches on the gastric juice and on the bile show their influence in the act of digestion and the preponderance of the nutritive and assimilative functions over all the others. His medical system, founded on the double basis of vitalism and chemical action, nevertheless placed the vital properties under the influence of the imagination and of occult causes. He regarded diseases as resulting from two causes, one physiological and the other material. He recognised in ferments the property of developing acids and he combatted these acids by means of alkalis and diaphoretics. His spiritualist system of archees for some time preserved the medical schools from the invasion of the mechanical and anatomical theories, which towards the end of the same century, threatened to invade them. It was the same with his chemiatric doctrine against which Pitcairne and his school rose, but which did not the less leave in science roots which have borne their fruit.

By the side of these beautiful results, due to a sagacity of the first order, and to a great spirit of observation, why should we be obliged to notice digressions and weaknesses which belong as much to the dominant ideas of the period as to the eccentricities of his own imagination? If he had been able to abstract himself from subjection to certain fixed preoccupations, if he restricted himself within the limits of reason and experiment, we cannot say how far this powerful genius would have gone, for it is certain that he as nearly as possible reached great truths which later times have revealed to science. Thus, because the sidereal revolutions governed the seasons, and because the meteorological influences acted on the organism in the state of health or disease, the medicine of the period, still so far from the reign of astrology, concluded on the direct action of the stars on the human body. Van Helmont was wrong in sustaining this doctrine with his authority, and in attributing to occult influences the natural phenomena which he could not explain, as well as in basing on a pretended revealed science opinions of which he could not give an experimental demonstration. Imbued with these mystical ideas, he too frequently sought truth only with a preconceived object. If he opposed Aristotle, it was because the latter believed in the inherent properties of matter, and because Van Helmont regarded matter as created by the Word of God. He went further, and, in order to make facts agree with his convictions, he devised explanations so strange, and sometimes enunciated errors so palpable, that they could only proceed from a mind struck with a systematic illusion. But at least this illusion was sincere, and, in his aberrations, he always guarded against altering the facts themselves in order to draw from them conclusions favorable to his theories. With a mind more original than judicious, more fertile in hypothesis than in deductions and in practical applications, he did not possess, moreover, the apparatus, the general data which science acquired only after his time, as his physiological views were affected by the deficiencies of his anatomical knowledge.

History, in glancing at the private life of this eminent man, can find nothing in it but what is worthy and honorable. The enemy of charlatanism, disinterested, but above all animated with an ardent charity, Van Hel-

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mont left the example of an irreproachable life, devoted entirely to works of intelligence and to the most noble and generous sentiments. It has been seen that he devoted himself to medicine only from charitable motives. It was with the same view that he gave up his wealth to his family, renounced the privileges of his birth, and refused all the titles of honor which were offered to him. He practised the healing art with the greatest disinterestedness, and it may be added, with real success. It was in vain that the Elector of Cologne and two Emperors of Germany, sought to draw him to their court; he never wished to quit his country, his dear studies, nor the unfortunate who depended on his intelligence and on his aid.

The alchemists of the middle age had derived their illuminism from their thirst for gold; Paracelsus was indebted for his to his pride; Van Helmont derived the exaltation of his ideas from a more respectable source—from a sincere piety and from his devotion to science. If it were necessary to distinguish him by other traits from the chief of the chemiatric school, we should say that if he resembled him in the ardor with which he opposed Galenism, if, like Paracelsus, he made concessions to theosophy, to astrology, to cabalistic and supernatural philosophy, he differed from him especially in this, that instead of using the doctrine to aggrandise the master, he sought only to establish its bases, and to specify its applications. If the bent of his mind led him, like the other, to exaggerate his opinions, to propound eccentric views, he far surpassed him in positive knowledge, extended erudition, patience, logic, and especially in nobleness and elevation of sentiments. He was at once an illuminatus and a conscientious man of science, but honesty of soul formed above all his principal characteristic. Sometimes a vigorous thinker, and a severe reasoner, with prophetic language, sometimes humble and modest, credulous and superstitious, he shows everywhere irreproachable candor and sincerity. He was one of those men of science who do most honor to the history of science; he was one of those men who most mix profound and bold views with the errors and caprices of an enthusiastic imagination, one of those who, through the eccentricities and conceptions of a fantastical brain, have left in science most new ideas and positive truths.

The style of Van Helmont, although poetical and full of images, is often deficient in clearness and does not leave the reader without fatigue. His obscurity arises from his very frequent employment of the forms of dialectics of the middle age, of the allegory so familiar to the alchemists, and of metaphors derived from mysticism. We find in it nevertheless fragments remarkable for elegance or for quite a biblical simplicity. His system of archees is a sort of epopee of which the subject is the physiology of the human body. In his writings against Galenism and school divinity he gave proofs of vigor and logic which sometimes elevated him to the height of Bacon, Descartes or Galileo. Notwithstanding all his horror of the eloquence of the theosophists, he was more than once obliged to employ their language to express opinions as ingenious as well founded. "It was in the way of error," says Cabanis, "that he made happy discoveries, and it was in the language of charlatans that he announced brilliant truths."

The greater part of the writings of Van Helmont were published only after his death, by his son, Francis Mercury, who was born in 1618.* His son, who had studied medicine, had a singular, bright, and original mind, piqued himself on his erudition, and likewise devoted himself to chemistry. His existence was very erratic: he more than once joined caravans of Bohemians to learn their manners, their habits, and some of their secrets relative to the arts. Being arrested in Italy by the Inquisition for some indiscreet expressions, he escaped and retired to Germany. He afterwards announced that he had discovered the primitive universal language, for it might be understood by the deaf and dumb. Leibnitz was struck with this idea, and had some faith in it. The variety of his talents and of his knowledge had acquired for him a certain reputation, and as he spent much money, it was reported that he had discovered the philosopher's stone.

We hope to be pardoned for entering into these details on account of the interest attaching to the celebrated name of Van Helmont. This name indeed closes the list of men of science of the middle age, to

* Van Helmont, in his youth, had composed commentaries on several books of Hippocrates. The manuscript being found among the papers seized by the official of the ecclesiastical court of Malines, at the time of the prosecution of the author in 1634, it was not known to his son, and does not appear in the collection of his works. Dr. Broeckx, having been enabled to procure the manuscript, has already published two portions of it, which cause us to look with eagerness for the remainder of this interesting work.

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whom scientific history attributes the first positive notions which we possessed concerning chemistry. On this account, which alone would command our respect, the writings of these men of science merit more than is perhaps believed, an attentive study. By the side of the important and established facts which they have bequeathed to us is found also more than one brilliant intuition of their genius which would gain, doubtless, by being disengaged from the rather rough matrix which conceals it. Many of these ideas, developed and matured by time, by the concurrence of foolish men and sages, men of theory as well as serious experimentalists, are the elements whence proceed and on which are founded most of our present sciences. Let us not then be either unjust or disdainful in their regard, and perhaps their examination may inspire us with some reserve on the subject of theories which appear to us now the real and definitive expression of truth.

ACTION OF WATER AT A HIGH TEMPERATURE AND UNDER HIGH PRESSURE, ON THE PYROPHOSPHATES, METAPHOSPHATES, CYANIDES, &c.

BY SENOR ALVARO REYNOSO.

THE experiments which form the subject of this memoir were made in the following conditions:—The substance is put with water into a green glass tube closed at one end, and sealed at the other end in a lamp, and this tube is introduced into a gun-barrel closed at one end with a hammer and at the other with a vice. This gun-barrel is placed in an oil bath which is heated to from 536 to 572° F. for five or six hours. It is necessary to operate in these conditions in order to be secure from the accidents which frequently occur, for at least 8 tubes in 10 explode. In these conditions the experiment is less dangerous. However, no other precaution must be neglected, for sometimes the gun-barrels are projected to great distances when the tubes explode. The oil may also be thrown out and take fire. Another accident which happens, especially when the oil is heated for the first time, is that it takes fire in consequenee of the froth which it produces.

PYROPHOSPHATES.

The pyrophosphates of potassa and soda, heated with water to 536° F. simply regenerate the phosphate of potassa and soda of the formula (PhO^5, 2MO, HO).

When we heat in water a pyrophosphate susceptible of forming an insoluble phosphate, it is divided into acid phosphate which remains in the liquor, and tribasic phosphate which is deposited almost always crystallised. The following is the general formula of this reaction:—

$$(PhO^5, 2MO)^2 + 2HO = PhO^5 3MO, + PhO^5 MO, 2HO.$$

However, the reaction is not always so simple, when the acid phosphate is susceptible of undergoing decomposition by heat; then the acid phosphate itself is decomposed into tribasic phosphate and phosphoric acid which remains in the liquor.

$$(PhO^5 MO^2 HO^3) = PhO^5 3MO + (PhO^5 3HO)^2:$$

so that there remains in the liquor nothing but phosphoric acid, and all the metallic phosphate is in the precipitate.

I have thought that other cases might occur in which the acid phosphate, in reacting on the tribasic phosphate, would give rise to ordinary phosphate of the formula PhO^5, ^2MO,HO. However, this never happens with a pyrophosphate capable of forming an insoluble tribasic phosphate; as I have already positively ascertained by heating for 48 hours acid phosphate of silver with the tribasic phosphate.

The decomposition of the acid phosphate may be partial or complete.

The pyrophosphates of zinc, silver, cobalt, nickel, and cadmium, heated with water, are divided into acid phosphates which remain in the liquor, and tribasic phosphates which are precipitated. The reaction is very clear with the pyrophosphate of silver, which, being white, heated with water, becomes yellow tribasic phosphate, which may easily be decanted, and acid phosphate which remains in the liquor.

The pyrophosphates of lead, copper and iron are also divided into acid phosphates and tribasic phosphates; but the acid phosphates are partially decomposed, so that there remain greater or less quantities of acid phosphate in solution.

Finally, the pyrophosphates of uranium and lime are divided into phosphoric acid and tribasic phosphate, in consequence of the decomposition of the acid phosphate. With the pyrophosphate of lime, there sometimes remain inappreciable traces of lime in solution, whilst the quantity of free phosphoric acid is very considerable.

The acid phosphate of lime, heated with water to 536°, is decomposed into tribasic phosphate and phosphoric acid; but the decomposition is never as complete as that

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which occurs in the acid phosphate in the nascent state produced in the decomposition of the pyrophosphate; moreover, it takes a longer time to be effected, and crystallised phosphate of lime is produced.

The acid phosphates present some common properties: all are precipitated by absolute alcohol, and there are produced amorphous hydrated tribasic phosphate and phosphoric acid which remains in the liquor, with more or less acid phosphate which is not completely precipitated by alcohol.

The phosphate which is obtained by precipitating the acid phosphate of cobalt by alcohol is of a delicate rose color. Its formula is:—

$$PhO^5,3CoO, 8HO.$$

The formula of that of zinc is

$$PhO^5, 3ZnO, 6HO.$$

All these acid phosphates have the property of dissolving a certain quantity of tribasic phosphate, which they abandon by boiling. All are presented under the form of gummy masses, having no appearance of crystallisation.

The tribasic phosphates obtained were all hydrated, and for the most part crystallised.

The phosphate of copper is of a rather yellowish deep green. It occurs in slightly acute octohedra, and under the appearance of crystals grouped in crosses, rectangular, with very short arms. The octohedra seem similar to those of the native phosphate of copper, with 6 per cent. of water.

The phosphate of cobalt presents the same forms as that of copper, but the crystals are smaller. It is of a rose color, and, when heated, it loses its water and becomes of a deep rose blue color.

The phosphate of lime occurs in rectangular tables.

The phosphate of lime arising from the acid phosphate heated occurs in ill-defined prisms, with truncated summits.

The phosphate of zinc was obtained under two forms: 1st in large flattened prisms, presenting symmetrical modifications on all their horizontal angles: 2nd in lamellæ.

The phosphate of lead occurs in rhomboidal tables.

All these crystals, except those of copper and cobalt—which have not been examined, interposed in the passages of polarised light, cause the image to reappear, and give colors through the analysing prism.

I have had an opportunity of observing other properties in the phosphates. The phosphate of silver heated in a platinum capsule nearly to redness, deepens in color, and becomes deep orange red, and, on cooling, resumes its original color.

Pyrophosphate of soda boiled with bichloride of mercury produces oxychloride of mercury of the formula

$$(HgCl, 4HgO.)$$

The pyrophosphate of uranium, when recently precipitated, is granular. Placed on a filter and left to itself for several days, it agglomerates, becomes transparent and very brittle, presenting a conchoidal structure.

The same phenomenon occurs with pyrophosphate of nickel.

METAPHOSPHATES.

The metaphosphates heated with water to 536° F., are divided into tribasic phosphates, acid phosphates, and phosphoric acid:

$$(PhO^5, MO)^6+12HO=PhO^5, 3MO+(PhO^5 MO, 2HO)^3+(PhO^5 3HO)^2.$$

When the acid phosphate cannot exist at 536° F., the metaphosphates are divided into tribasic phosphates and phosphoric acid. This occurs with the metaphosphate of lime,

$$(PhO^5CaO)^6+12HO=(PhO^5 3CaO)^2+(PhO^5 3HO)^4.$$

IODIDE AND BROMIDE OF CYANOGEN.

M. Pelouze having discovered that hydrocyanic acid is decomposed in water into formiate of ammonia, and as the iodide and bromide of cyanogen may be regarded as hydrocyanic acid in which bromine and iodine replace the hydrogen, I wished to know what would be the action of water on these compounds.

Subjected to the action of water at 536° F., they are divided into carbonic acid and hydriodate or hydrobromate of ammonia.

$$C^2BrN+4HO=(CO^2)^2+BrH, NH^3,$$
$$C^2IN+4HO=(CO^2)^2+IH, NH^3.$$

However, these products must be of secondary formation, for iodurette or bromurette formiate of ammonia ought to have been formed. Now, as bromurette or iodurette formic acid cannot exist without being decomposed into carbonic acid and hydriodic or hydrobromic acid, the reaction may easily be conceived.

CYANIDES.

The cyanides of silver and mercury heated in closed tubes to 536° are decomposed into carbonate of ammonia and metallic silver or mercury. The silver is sometimes very well crystallised.

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The other cyanides are decomposed into formiate and carbonate of ammonia, and into metallic oxides.

The ferrocyanide and ferridcyanide of potassium are completely decomposed into formiate of potassa, carbonate of ammonia, and oxides of iron.

SULPHOCYANIDES.

The sulphocyanide of potassium heated with water to 536° F. is decomposed into bicarbonate of potassa and hydrosulphate of sulphuret of ammonium.

$$C^2NKS^2+6HO=(CO^2)^2KO,HO+(SH)^2NH^3.$$

ORGANIC BASES.

I have not studied all the organic bases in this point of view. But, from some experiments which I have made, I think I may conclude that the organic bases, heated with water to from 464 to 500° F., produce the same volatile bases as when heated with potassa. Thus, I have obtained with narcotine, metacetamine, and with quinine, quinoleïne. It will be remembered that this last base was obtained by M. Gerhardt by heating the caustic alkalis with quinine.—*Comptes Rendus*, No. 21, May 24, 1852.

COMPARATIVE ANALYSES OF THE BLOOD OF THE VENA PORTA AND SUPERHEPATIC VEINS.

BY M. LEHMANN.

It is ten years since M. F. Simon published two comparative analyses of the blood of the vena porta and the superhepatic veins. But the methods of analysis which he employed were so imperfect that his work has not led to very clear physiological consequences, and has remained to a certain extent fruitless.

M. Lehmann thought fit to resume the study of this question, whose solution is connected with one of the most important problems of physiology—that which relates to the functions of the liver and to the secretion of the bile. M. Lehmann's analyses were made on the blood of horses killed five or ten hours after feeding. Immediately after the death of the animal, the abdominal cavity was opened, and the principal trunks of the vena porta and superhepatic veins were tied. The blood was collected after having well separated the vessels in such a manner as to render the introduction of any other venus blood impossible.

Before pointing out the general conclusions at which M. Lehmann has arrived, we will give in the following table the principal results of his analysis :—

	No. 1.		No. 2.		No. 3.	
	Vena Porta.	Sup. Veins.	Vena Porta.	Sup. Veins.	Vena Porta.	Sup. Veins.
Globules	600·520	776·396	572·632	743·400	256·928	578·476
Interglobular liquid	399·480	223 604	427·368	556·600	743·072	421·524
	1000·000	1000·000	1000·000	1000·000	1000·000	1000·000
Globules	600·529	776·396	572·632	743·400	256·928	578·479
Water	405·275	486 785	389·914	474·190	181·977	366·164
Coagulable matter	176·420	255.941	163·526	234·852	73·182	197·026
Iron (metallic)	0·430	0·325	0·569	0 647	0·279	0·584
Fat and extractive matter	10·958	25·692	14·848	27·568	—	9·838
Salts	4·445	7·653	3·975	6·149	1·490	4·902
Interglobular liquid	399·480	223·604	427·368	256·600	743·072	421·524
Water	363·938	199·674	387·530	229·690	679·440	376·957
Fibrine	5·010	—	4·240	—	5·920	—
Albumen	24·453	16·703	29·603	19·952	44·340	32·449
Fatty matters	1·103	0·640	1·154	0·634	2·172	1·117
Extractive matters	1·837	5·017	1·223	4·464	5·089	7·566
Salts	3·089	1·570	3·618	1·860	6·111	3·465

In the foregoing table the globules are calculated in the humid. Sometime since M. Schmidt was led to admit that the globules are obtained in the humid state by multiplying by four the cypher of the dry globules calculated according to the process of MM. Prevost and Dumas. By applying this method, with some modifications, the author arrived at the cyphers given in the foregoing table.

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The following are the principal results at which M. Lehmann has arrived:—

The blood of the vena porta of horses killed five or ten hours after feeding presents no essential difference in its physical properties or in its composition, from the venous blood of the general system.

The red globules of the superhepatic veins are smaller and less regularly lenticular than those of the blood of the vena porta.

The blood of the vena porta contains colorless globules, like the blood of the other veins. That of the superhepatic veins was richer in colorless globules than that of the other veins (with the exception of the splenic veins). The colorless globules were very different from each other with regard to size and form.

The fibrine of the blood of the vena porta is identical with that of the blood of the other veins.

The blood of the superhepatic veins does not contain fibrius, or contains only very small quantities of it.

In the blood of the vena porta only very little sugar is found; in that of the superhepatic veins there is more than in any other venous blood. This result, identical with those obtained by M. Bernard, confirms the hypothesis enunciated by that distinguished physiologist, which admits that the liver elaborates a certain quantity of sugar.

The peculiar materials of the bile, or the products of their proximate decomposition, have not been discovered in the blood of the vena porta.

The blood of the superhepatic veins gives a more bulky clot and less serum than ordinary venous blood or arterial: five hours after eating, it contains on the average $\frac{1}{5}$th more globules than are contained in the vena porta.

The density of the serum of the two kinds of blood varies but a little during and after digestion. The solid materials of the serum of the vena porta vary from 7·7 to 8·5 per cent.; those of the serum of the superhepatic veins vary from 10·5 to 10·7 per cent. The serum of the blood of the superhepatic veins contains more albumen, less salts, and much less extractive matters than the serum of the blood of the vena porta.

But if we compare the total quantities of materials contained in the serums (of two equal weights of blood), it is found that the blood of the superhepatic veins contains $\frac{1}{8}$th less albumen, $\frac{1}{4}$th less fat, two or three times as much extractive matters, and about half as much salts as the blood of the vena porta.

The globules of the blood of the vena porta contain more water and more iron, less globuline, less extractive matters, and less salts than those of the blood of the superhepatic veins.

The blood of the vena porta and that of the superhepatic veins contain less globules ten hours after eating than five hours after. The differences of composition which we have just pointed out are much less sensible ten hours after feeding than five hours after.

From these facts M. Lehmann draws the following conclusions:—

1. The bile is elaborated only in the liver by the aid of substances which present no analogy with the principal materials of the bile.

2. In the capillaries of the liver there is a formation of blood globules, so that their number augments, or else, which is less probable, that each globule increases in weight by the addition of new solid materials.

3. A certain quantity of fibrine is destroyed in the liver.

4. A great portion of the albumen in the liver is elaborated by that organ. The albumen and fibrine which disappear serve, doubtless, not only for the elaboration of the bile and sugar, but also for the formation of new globules.

5. The lion elaborates a great quantity of extractive matters.

6. The salts of the serum of the vena porta serve partially for the secretion of the bile, and pass for the most part into the globules of the blood of the superhepatic veins.

7. It is not the blood globules of the vena porta, but the interglobular liquid, which furnishes the materials serving for the secretion of bile.

8. Ten hours after feeding, the secretion of bile should be much more considerable than five hours after.—*Journal für praktische Chemie.*

ON THE ACTION EXERTED BY THE ACIDS, BY HEAT, AND BY THE ALKALINE AND EARTHY CHLORIDES ON ESSENCE OF TURPENTINE, AND ON ITS HYDRATE, ON SUGAR AND ON ALCOHOL.—PRODUCTION OF THE ETHYLIC ALKALIS BY HYDROCHLORATE OF AMMONIA.

BY M. MARCELLIN BERTHELOT.

I.

1. ESSENCE OF TURPENTINE.

Action of the Acids.—The powerful mineral acids in general act without heat on

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essence of turpentine: sulphuric and phosphoric acids cause it to undergo an isomeric transformation; this fact is well known from the important researches of M. Deville on the production of terebene and colophene. Nitric acid exerts a peculiar mode of action; it determines by its presence alone the slow fixation of the elements of water on the carburet. Alone, hydrochloric acid combines with the essence, and gives rise to artificial camphor.

These facts, which have long been known, are the only cases in which the action of the acids on the essence has been examined. I have resumed the study of this question; the following is the result of my observations:—At 212° F., the weak mineral acids (boracic), the organic acids (oxalic, citric, acetic, tartaric), and chloride of zinc, all of which are inactive at the ordinary temperature, isomerically modify essence of turpentine. This action appears likewise to vary in its nature and in its intensity, according to the acids employed. It is exerted without either the acids or the chloride of zinc entering into solution in the essence at any period of the experiment, and without any portion being fixed on themselves. These are purely actions of contact. They require, moreover, a certain number of hours to be accomplished, and are operated in close vessels, conditions common to all the actions indicated in this memoir.

Heat.—No other substance appeared to me to act on the essence, until heated to 464° F. At from 464° F. to 482° F., the essence heated alone begins to be modified isomerically, and to undergo various transformations to which I shall revert in an early memoir. This spontaneous action is moreover very slow.

Chlorides.—It is singularly accelerated and modified by the intervention of various substances. Water, the chlorides of calcium and strontium, the hydrochlorate of ammonia, and fluoride of calcium especially, all of which matters are insoluble in the essence at every temperature, exert an extremely marked action. The rotatory power and the density of the essence change in a few hours, without any disengagement of gas or formation of new products. The accelerating action of the fixed alkaline chlorides and of chloride of barium is not very distinct.

Impressed with these phenomena, in which the action of certain bodies on another body put in contact with them is manifested with so much certainty, I tried to extend the action of the chlorides to various other bodies heretofore modified only by the action of the acids.

2. HYDRATED ESSENCE OF TURPENTINE.

This body, as is known, is separated by heat, under the influence of the acids, into water and terpinol ($C^{20}H^{16}$, HO). This same transformation is operated in contact with sulphate of zinc at 212° F., by heat alone, at 392° F., in contact with the chlorides of calcium and strontium, fluoride of calcium and hydrochlorate of ammonia between 320° and 356° F. At this temperature, water, chloride of barium, and the fixed alkaline chlorides, appeared to me to have no action.

3. SUGAR.

Sugar presents analogous phenomena, which phenomena are, for the most part, known or suspected, but not hitherto proved, I think, in as clear conditions. Sugar, it is known, in the presence of dilute acids, is changed into glucose with fixation of water. The concentrated acids blacken it, and separate water from it, an analogous action in the latter respect with that of heat. In the same way, chloride of zinc transforms cellulose and, *à fortiori*, sugar, into glucose, according to the recent observations of M. Barreswill.

The chlorides which act on essence of turpentine also act on sugar. The earthy chlorides convert it into glucose, at 212° F., in a few hours. With chloride of calcium, and especially with hydrochlorate of ammonia, the action proceeds rapidly until the sugar is very much browned.

These reactions, operated in close vessels, and at 212° F., require the presence of a trace of water for their development. Water alone acts on sugar in these conditions, but with extreme slowness. Moreover, we know with what care M. Soubeiran has studied the successive transformations undergone by an aqueous solution of sugar maintained in ebullition.

The fluoride of calcium and the fixed alkaline chlorides do not appear to accelerate the action of water.

4. ALCOHOL.

Acids.—Every one knows the etherfying action of the acids and of the metallic chlorides, which action gives rise sometimes to ethereal compounds, sometimes to ether properly so called, and sometimes to gaseous, liquid or solid carburets, the isomers of olefiant gas.

Heat.—The action of heat studied and graduated with care, appears to be inoperative until red heat is reached. The decomposition then produced seems to be very complex as soon as it is manifested: it is always accompanied by a formation of olefiant gas. I have been able to operate in

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close vessels without deposition of carbon; I have not found ether in its products.

Chlorides.—The action of the chlorides is more clear. Magnus had already tried to etherify alcohol by means of chloride of calcium at 464° F., but without success. I have been more fortunate. Absolute alcohol, heated in a close vessel with this substance, pure and crystallised, begun to develop ether at 572° F.; at 680° F., it gave ether and olefiant gas, and that without alteration of the chloride. The chloride of strontium acted in the same way with less energy.

Water, the chlorides of barium and of the alkaline metals, iodide and bromide of potassium and fluoride of calcium, appeared to me to be without action even at 680° F.

5. WOOD-SPIRIT.

Pure wood-spirit acts in the same way. Heated alone to 680° F., it begins to become turbid by the addition of water. Chloride of calcium developes in it gaseous hydrate of methylene at 482° F. Above 572° F., it causes oily liquids to appear simultaneously; these are doubtless carburets.

Chloride of calcium does not act at 680° F., either on the ether, or on the aqueous solution of hydrate of methylene.

In these experiments, the olefiant gas was recognised and estimated by a very simple method, discovered by M. Balard, and which he has been kind enough to permit me to publish here. It consists in the employment of liquid bromine for absorbing olefiant gas. Direct experiments have shown that this absorption is instantaneous and accurate to one-hundredth, even in presence of hydrogen, oxide of carbon and marsh gas. The operation is performed over water by agitating the gas with a little bromine in a corked flask.

II.

It had occurred to me to turn to useful ccount the production of the bicarburetted hydrogen, thus developed in the nascent state in a neutral liquor at a high temperature, in order to cause it to be absorbed by hydrochlorate of ammonia, and to produce in this way the hydrochlorates of the ethylic alkalis.

I heated this salt at first with the alcoholic solution of chloride of calcium, and then separately with absolute alcohol. The results thus obtained led me to make with sal ammoniac, on essence of turpentine and on sugar, the experiments which I have already mentioned. The action of hydrochlorate of ammonia on alcohol presents two distinct orders of phenomena—etherification, on one hand, and the production of the ethylic alkalis on the other.

1. *Etherification.* — Hydrochlorate of ammonia acts on alcohol in the same manner as chloride of calcium. It etherifies at 500° F. Towards 752° F., the decomposition of the alcohol is nearly complete; the liquid contained in the tube is separated into two layers, one aqueous, the other ethereal. The formation of the olefiant gas is not very abundant. This action is still more clear and complete at 680° F., with hydriodate of ammonia.

2 *Production of the Ethylic Alkalis.* —In the aqueous layer, under the ether, is found in solution a mixture of hydrochlorates (or hydriodates) of the ethylic bases. Ethylamine predominates among these products. The analysis of the platinum salt demonstrated these facts, indicated by the reaction of the salt obtained. All the elements, except the chlorine, were estimated.

The production of ether appears to precede the fixation of the bicarburetted hydrogen by the ammoniacal salt. It also occurred to me to heat ether itself alone with hydriodate of ammonia. The liquid heated to 752° F., separated into two layers; one was pure ether, and the other an aqueous solution of the ethylammic hydriodates. The formation of olefiant gas was scarcely perceptible. The production of water at the expense of the ether, without liberating gaseous or liquid carburetted hydrogen, agrees with the fixation of the elements of the carburet on the hydriodates. In this particular case, I had indications of the fourth alkali of Dr. Hoffmann, in the products obtained.

The free olefiant gas, heated in close vessels with hydriodate of ammonia was not at all absorbed.

I likewise prepared with pure wood-spirit and hydrochlorate of ammonia, hydrate of methylene, oily liquids, and the hydrochlorates of the methylic alkalis—the latter at 57° F. The salt of platinum obtained appeared, according to a complete analysis of it which I made, to contain these alkalis at least to the extent of one-third.

Here the formation of the alkalis precedes the etherification, and appears to commence at 212° with hydriodate of ammonia, although in an almost insensible manner and very slowly at that temperature.

The facts which I have just detailed are presented, I think, in a clearer manner in the ancient theory of bicarburetted hydrogen, that of M. Dumas, than in the theory of ethyle. Perhaps we must admit in the theory of the ethylic compounds the double physiognomy which that of the ammoniacal salts already presents. Ammonium, ammonia, ethyle, bicarburetted hydrogen, such

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are the two points of view under which we may conceive the constitution of the two series of which all the theories have seized the analogy.

What is the connection between the several phenomena which I have just described? All, it appears to me, result from an action of contact, an action often exercised without the intervention of even a virtual combination, an action entirely conformable, moreover, to the ideas developed by M. Mitscherlich. Under the influence of these bodies, acids and chlorides, the molecule changes, it is modified isomerically, if I may so speak in all cases, and the new molecule formed is capable of presenting, either in its own constitution and its stability,* or in connection with the bodies in presence of which it was formed, aptitudes and new affinities.—*Comptes Rendus*, No. 21, May 24, 1852.

ON HIRCINE, A NEW RESIN.

BY HENRY PIDDINGTON, CURATOR OF THE MUSEUM OF ECONOMIC GEOLOGY, BENGAL.

I HAVE not yet ventured to announce this as a new *mineral* resin, though I think it may be so. It was placed in my hands by Mr. Theobald, senior, with a request that I would examine it. Mr. Theobald has not yet been at liberty to furnish me with any memoranda regarding its locality, but expects soon to be able to do so.

It should be observed, that we had only a small lump of it weighing barely an ounce troy; and it was of course desirable to keep as much of this as possible for a museum specimen.

This resin is brown on the external parts, and of a very brown yellow color internally. It is generally opaque, but is slightly translucent at the edges. It is tough to break, and very tough and elastic, leaping out of the mortar if not covered up while pounding. Its fracture is hackly in small pieces, but conchoidal in the large. Its specific gravity is 1·10; but if freed from the external rough coat, which could not be completely divested of air bubbles, it would probably be 1·2, or thereabouts.

It melts in the flame of a candle, and an impression may be taken upon it, resembling in this respect very bad bazaar sealing wax.

It burns in the forceps, or in a porcelain capsule, with a blazing yellowish flame, with numerous strong jets of gas, and a dark smoke like the best bituminous coal. Towards the end of this first combustion, it swells into a round, tough, carbonaceous ball, and the flame expires. This ball has a very peculiar semi-animal odor, which may be described as that of coarse hair, or hircine, whence its name; but is not so strong as to be altogether disagreeable. When this coal is again heated upon a large piece of platinum foil, it swells, and flames, and jets exceedingly, the gaseous emanations covering the whole of the platinum foil with flame, as if alcohol, ether, or naptha was projected from the burning mass! When the flame expires, it leaves a very light charcoal and a coat of gray dust on the platinum. The whole of this dust and coal, when burned to a gray ash in a platinum crucible, is found by acids and the blowpipe to consist of minute portions of iron and silica without any trace of lime or alumina.

By boiling in distilled water, it softens, and the powder gives out with the steam the peculiar odor above alluded to. It does not color the water in any material degree, but nitrate of silver renders the solution slightly turbid. When it is evaporated, a slight portion of a white gummy matter is left in the capsule, which has no smell or taste, so far at least as a minute trial with a small quantity of the resin could ascertain.

It is but little soluble in cold alcohol. In boiling alcohol about one-half of it, or less, is dissolved when powdered, giving a gold-yellow solution; the insoluble part is a brown granular residuum, and the alcohol has flaky white masses suspended in it, which do not settle. These collected on a filter give a grayish white crust, which boiled in fresh alcohol dissolves also, leaving only a little granular deposit, the alcohol remaining colorless. Upon platinum this white crust ignites quickly with a bright white flame, and burns without any residuum, but always with the peculiar hircine odor, though not in so strong a degree. When the alcoholic solution of the white crust is evaporated, it leaves a dirty greyish white mass, which has an agreeable odor, but does not, in the small quantity experimented upon, resemble a resin, as it coagulates in clots and masses in the watch-glass.

The alcoholic residuum is a light brown resin, which burns with a bright clear flame, and leaves a white powdery ash as before. The latter portions of the smoke have a musky odor, which, like the hircine one of the original resin, is not disagreeable.

* Perhaps the decomposition of oxygenous water in presence of certain bodies is referable to this order of phenomena.

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This alcoholic residuum is insoluble in ether, or but very partially soluble, giving only a faint yellow color to it.

When the pure and filtered yellow alcoholic solution is allowed to evaporate, it gives an orange-colored resin, which burns with a bright, clear yellow flame after fusing to a bright orange-red mass.

This resin is almost totally soluble in ether, giving a bright yellow solution with but a trifling residuum. Its smell is a strong sugary one, like a cask of raisins.

In concentrated nitric acid it becomes a tough, bright, yellow, pasty and frothy mass, and partly dissolves, coloring the acid of a bright straw-yellow color. The pasty residuum adheres somewhat to the fingers, but could not be further examined.

The nitric acid solution gives a white precipitate with carbonate of potassa, which is mostly soluble in an excess of the alkali; but a portion of it remains as a silky precipitate.

In acetic acid it also gives a straw-yellow solution, which is precipitated by carbonate of potassa; but this precipitate does not appear to be soluble in excess of the alkali, and is silky, like the residual precipitate from the nitric acid solution above described. When the acetic acid solution is evaporated it gives a brown resinous-looking material, which is soluble in alcohol.

Its reactions with the strong sulphuric acid are the most remarkable, and with the effect of nitric acid on the alcoholic solution seem quite to distinguish it from any of the resins or gum-resins of which we have any record*.

It dissolves almost totally (leaving only, I think, a few of the surface impurities), giving a deep blood-red solution, which appears like an inspissated venous blood, which after some days changes to a deep brown. When diluted, this solution becomes of a dull, dirty, troubled white color.

With carbonate of potassa, a white, cloudy, and silky precipitate is shown.

Dropped into ammonia with precaution, it colors the solution brown; and finally, when left to settle after saturation, gives clots of a dark brown glutinous matter, which seems to be the original resin in a softened state.

It appeared worth while to examine the action of the acids on the alcoholic solution, as these effects are well marked with guaiacum and some other of the resins. The results were:—

The alcoholic solution with nitric acid diluted with one-fourth water changes only from a golden-brown to a clear gold color, and no change occurs after forty-eight hours.

The same takes place with the phosphoric acid, with a slight white deposit.

With sulphuric, muriatic, and acetic acids a white precipitate is produced, which is less plentiful with the acid than with the two first. In all of them the fluid shows no alteration of color, except as above noted from the golden-brown to a clear yellow or golden color.

We cannot, from so small a portion, form any opinion of its economical uses as a varnish, or for sealing wax, or any of the purposes to which shell-lac is applied; nor can I spare any of it to ascertain its habits with turpentine and naptha. We are also ignorant if it is abundant, and at what rate it can be obtained.—*Journal of the Asiatic Society, Bengal*, No. 1, 1852.

* Mr. Hatchett, Phil. Trans. for 1806, p. 92, says, that guaiacum gives also a deep red color to sulphuric acid, but then it undergoes various changes of color, from green to blue and brown, when nitric acid is added to the alcoholic solution, which, as will be subsequently seen, hircine does not. Hircine in the mass looks much more like a piece of guaiacum *wood (Lignum vitæ)* as to color, but not weight, than like the gum-resin of that name, which indeed it does not at all resemble.

ON PARICINE.

BY M. WINKLER.

PARICINE was discovered by M. Winkler in a bark imported from Para into England, and was afterwards noticed among the principles contained in the bark of the Jaën quinquina (China Jaën Pallida). To recal by the name the analogy of composition of these two barks, M. Winkler has proposed to call the Para bark China Jaën fusca.

The Para bark contains paricine combined with a great quantity of a matter analogous to the cinchonic red. It contains also quinate of lime, but not a trace of quinovic acid.

To extract paricine from it, M. Winkler exhausts it three times with at least three times its weight of boiling alcohol at 80 per cent. The greater part of the alcohol is distilled, and the aqueous residue is evaporated on a sand-bath, leaving a resinous mass of a brown red. The dried mass is powdered as finely as possible, and digested at a very gentle heat with dilute hydrochloric acid (1 part of concentrated acid and 30 parts of water). After 12

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hours it is filtered and the liquor is precipitated with carbonate of soda. The precipitate is collected on a filter, washed and dried at a gentle heat. It is then very pure hydrated paricine. The resinous mass, insoluble in dilute hydrochloric acid, is exhausted on a sand-bath by means of a very concentrated solution of carbonate of soda. There remains a brown pulverulent matter which is again subject to the action of dilute hydrochloric acid, which extracts from it a further quantity of paricine, which is precipitated with carbonate of soda.

The hydrated paricine thus obtained is exhausted with ether. An insoluble flocculent matter remains, and an ether solution of paricine is obtained, which is treated with animal charcoal. By the evaporation of the liquor, the paricine remains under the form of an almost transparent gummy mass, colored of a reddish yellow. It is redissolved in very dilute hydrochloric acid, and hydrate of paricine is precipitated with carbonate of soda, and dried at a gentle heat.

Thus prepared, this substance forms an amorphous mass, light, porous, friable, colored of a pale yellow, insoluble in water, soluble in alcohol and ether. It dissolves in the acids, forming uncrystallisable salts. In the neutral state, the solutions of these salts are precipitated by concentrated acids, and the precipitates are dissolved in pure water.

Paricine forms besides with chloride of platinum, a double salt containing 15·58—15·63—16·20 per cent. of platinum. The ill defined properties of this body, and the uncertainties of the analyses to which it was subjected, and which present much too great oscillations, as the foregoing cyphers prove, lead us to fear that the substance obtained by M. Winkler was not perfectly pure, and that the very probable formula $C^{46}H^{25}N^{2}O^{6}$ by which he tries to represent its composition, is not founded on sufficiently certain data.—*Neues Repertorium für Pharmacie*, t. I, page 2.

ON THE DETERMINATION OF PHOSPHORIC ACID BY MOLYBDATE OF AMMONIA.

BY W. J. CRAW, ASSISTANT IN THE YALE ANALYTICAL LABORATORY.

THE determination of phosphoric acid has always been one of the most important and most difficult problems of analytical chemistry. It is very widely diffused in nature, occurring in the soil, the ashes of plants, and a great number of minerals. The bases with which it is most frequently united are iron, alumina, the alkalis and alkaline earths. Several of these combinations are decomposed with very great difficulty, the phosphate of alumina in particular resisting nearly every effort to reduce it to its component parts.

Although good methods have been proposed for the analysis of many of the simple phosphates, that of phosphate of lime for instance, yet it usually happens that several of these occur together; and until very recently no process has been devised which could effect the separation of phosphoric acid from all the bases previously mentioned, when in company.

A great amount of labor has been spent by chemists, within the last few years, in the effort to overcome this difficulty. Numerous ways have been tried with greater or less success, but most of these contain inherent difficulties, which in many cases prevent their application. Even Rose's process by carbonate of baryta, though a standing monument of profound knowledge and admirable research, is yet too complicated to yield good results, except in the hands of those who have practised it so often as to be perfectly familiar with all the necessary precautions.

The great desideratum of a simple and accurate method for the determination of phosphoric acid, with whatever substances it may be combined, has been supplied by Sonnenschein.* He states that the yellow precipitate produced by molybdate of ammonia in the solution of a phosphate contains phosphoric acid as an essential constituent, and not, as asserted by Svanberg and Struve, an accidental admixture. From several analyses of this compound he finds it to contain about three per cent. of phosphoric acid. A number of trials were also made to ascertain whether by this means phosphoric acid could be separated and determined quantitatively, which were completely successful. For this purpose a large quantity of the molybdate solution is prepared as follows:—one part of molybdic acid is dissolved in eight parts of ammonia and twenty of nitric acid. The phosphate is dissolved in nitric acid, and there is added to it a quantity of molybdic acid equal to about thirty times that of the phosphoric acid. The solution with the precipitate is digested for some hours with the aid of a very gentle heat, filtered, and washed with the same solution which was used for the precipitation. The whole is then dissolved

* Journ. für Prakt. Chem., vol. liii. p. 339.

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in ammonia, and the phosphoric acid thrown down by a magnesian salt. The presence of molybdic acid is not injurious, as the double molybdate of ammonia and magnesia is easily soluble.

Sonnenschein's experiments on the separation of phosphoric acid from alumina and other bases all gave very good results.

With the view of confirming this discovery, and also of ascertaining with more precision the cause of the peculiar behaviour exhibited by this substance towards reagents, I have made a number of trials with it. Among other substances, the action of the mineral acids and of the ammoniacal salts has been more particularly tested.

The yellow powder is found to be in—

Chloride of ammonium	easily soluble.
Oxalate of ammonia	easily soluble.
Sulphate of ammonia	sparingly soluble.
Nitrate of potassa	sparingly soluble.
Chloride of potassium	sparingly soluble.
Sulphate of magnesia	sparingly soluble.
Nitrate of ammonia	very little soluble.
Sulphate of potassa	soluble.
Sulphate of soda	soluble.
Chloride of sodium	soluble.
Chloride of magnesium	soluble.
Sulphuric acid, strong and dilute	soluble.
Hydrochloric acid, strong and dilute	soluble.
Nitric acid, strong and dilute	soluble.
Hot water	soluble.

In all these cases the mixture was heated to boiling. Solutions of the caustic alkalis and the alkaline carbonates and phosphates dissolve the yellow compound even in the cold. So also do chloride of ammonium and oxalate of ammonia. The mineral acids also act upon it to some extent. Cold water dissolves it with great difficulty. It appears to be decomposed to a small extent by the combined influence of air and moisture, as it turns blue when dried in the atmosphere after washing with water. Its behaviour towards solvents is changed by the presence of molybdate of ammonia, so that it becomes nearly insoluble in acids even on boiling. The act of solution is, probably in all cases, attended with decomposition and removal of molybdic acid, which is prevented by the presence of molybdate of ammonia.

Some quantitative experiments were also made on the separation of phosphoric acid from the bases. It may be important to remark, that when effecting the precipitation by means of molybdate of ammonia, this, as well as the nitric acid, should be in decided excess. To ascertain when this is the case, before filtering off the solution, a drop of it may be taken up with a pipette, and transferred to a test-tube containing solution of sulphuretted hydrogen, when the brown precipitate of sulphuret of molybdenum will appear.

After separating the precipitate from the solution, the latter should always be allowed to stand for some time in a warm place, to see whether any additional precipitate is formed.

Experiments.

I. Taken 0·1199 grm. of tribasic phosphate of soda, which was dissolved in nitric acid, a pure solution of lime added, and the phosphoric acid determined according to the directions already given :—

	Calculated.	Found.
Phosphoric acid ..	0·0238	0·0243

II. Taken 0·069 grm. of phosphate of soda, and mixed with solutions of iron, alumina, lime, magnesia and potassa; the phosphoric acid then determined as before :—

	Calculated.	Found.
Phosphoric acid ..	0·0137	0·0146

III. Taken 0·0463 grm. of phosphate of soda, mixed with solutions of the same substances as in the last, and the phosphoric acid determined in the same manner :—

	Calculated.	Found.
Phosphoric acid ..	0·0092	0·0095

These results confirm those of Sonnenschein, and show that the method, as regards accuracy, is all that can be desired, while, in point of simplicity, it is superior to any of the old processes.

It will prove of especial advantage in cases where, as in the analysis of soils, a small quantity of phosphoric acid is associated with a variety of other substances existing in much larger proportion.—*Silliman's Journal*, May, 1852.

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II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

NEW RESEARCHES ON THE NUTRITION OF OATS, PARTICULARLY AS REGARDS THE INORGANIC MATTERS WHICH ARE NECESSARY FOR THEIR NUTRITION.*

BY THE PRINCE OF SALM HORSTMAR.

I HAVE collected, in a table, the results of the further experiments which I undertook to perform concerning the inorganic substances principally necessary for the fructification of oats. The process adopted was that described in my first memoir (see CHEMIST, vol. 1, 1849-50, page 24). Generally, the oat seeds were sown in a soil composed of 58 grammes of powdered rock crystal, and contained in vessels formed of wax. The exceptions are pointed out in the table.

The various matters whose effects have been studied were prepared by the processes described in my previous researches; when different ones have been employed, the circumstance is mentioned.

The alumina was precipitated from the sulphate of alumina and ammonia, crystallised several times; it was digested with carbonate of ammonia. The phosphate of iron was perceptibly basic.

The reason for which titanic acid was added to the list of substances whose effects were investigated, arose from this acid having been discovered in the argil of Almeroden (see the details of Experiment No. XXVIII., vol. III., p. 70), which contains about 1 per cent. of it, and as the fructification succeeded well in the plant grown in this argil, it was necessary to try the action of all the substances which it contained.

This mode of procedure was so much the more justified, as I found the titanic acid in most of the soils of Westphalia, and especially in the sand of the North Sea, which sand is mixed with the soil of Europe to a considerable extent.

I will remark, on this occasion, that titanic acid has been neglected in most analyses of soils.

However, I have been led to this result that it is not the titanic acid which contributes to the fructification of the oat, but a small quantity of soda contained in the argil of Almeroden, which soda is combined with phosphate of iron, and not with the alumina of the argil.

According to my previous investigations, alumina appeared to be an ingredient essential to the fructification of the oat; my new experiments have not confirmed this view; they even prove quite the contrary, showing that basic phosphate of iron may replace alumina. We thus arrive at the conclusion that alumina is not necessary to the fructification of the oat. These experiments demonstrate also that a basic phosphate is necessary to the fructification, which indeed is in conformity with the well-proved fact that the phosphates are always in the basic state in soils.

The carbonates of soda and potassa appear to have an injurious effect. Soda and potassa seem to be beneficial to oats only in the state of silicates or nitrates, or else in combination with humic acid (the extractive substance of the soil).

I was surprised to see an oat plant come up very well in a soil in which nitrate of potassa had been substituted for silicate of the same base. The plant, however, contained silica, which was probably derived from the quartz constituting the soil; for it was purposely watered as seldom as possible, with water which had been twice distilled, and which was kept free from dust, in a glazed vessel.

The skeleton of this plant consisted decidedly of silicic acid.

The weight of the plant, dried at 176° F. was 0·478gr. It bore only one grain, which weighed 0·036gr.; this grain was not incinerated.

The weight of this plant without the roots was 0·0514; the weight of the ash was 0·032gr.; and the weight of the skeleton, consisting of silicic acid without charcoal, was 0·007gr.

The ash contained therefore 23 per cent. of silica, a proportion that agrees in a striking manner with that determined in another plant cultivated in calcined marl, to which were added nitrate of ammonia and *beech ashes*.

* For the previous memoirs by the Prince of Salm Horstmar, see "THE CHEMIST," vol. I., 1849-50, p. 24, and vol. III. pp. 19, 68, 120, 163, 268.

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These experiments prove that the nitrate of potassa and soda may replace ammonia.

Experiment No. LXXIX merits especial mention, because the plant bore no lateral shoots late in its growth, and because, consequently vegetation was accomplished in a normal manner.

Experiment No. LXXVI is interesting, in as much as a natural sand, well washed before being mixed with the seven substances designated, and with nitrate of ammonia, but without the addition of soda, produced a plant which bore no seeds.

Experiment No. LXXV also shows the necessity of the presence of iron for the developement of the oat.

In order readily to show the influence which the various agents employed exert on the production of the grain, I here tabulate the experiments in which the plant bore seeds.

No. of the Experiment.		Flowers.	Seeds.	Late lateral shoots.
XXVII*	With hydrate of alumina	7	2	2
XXVIII	With argil of Almeroden	8	5	2
XXX	With feldspar	4	2	2
XXXI.	With silicate of alumina	6	2	2
XXXIII	With river sand, calcined	9	8	0
XXXIV	With the same sand	8	6	0
XXXV	With the same sand, purified with hydrochloric acid.....	11	9	0
LVIII	With alumina and soda.....	6	6	Trace.
LIX	With the same substances without manganese	6	4	0
LXVIII	Without alumina, but with phosphate of iron	4	5	0
LXXII	With nitrate of soda, without phosphate of iron, without alumina, and without silicate of potassa	8	1	0
LXXIX	With nitrate of soda, and without alumina	3	3	0
	All the Seeds germinated.			

* All the experiments up to No. XLVI were detailed in the last memoir.

It results from these experiments that soda is essential to the fructification of the oat, provided that a basic phosphate be present, as well as the seven inorganic matters, which are sufficient for the production of flowers, namely: potassa, lime, magnesia, oxide of iron, silica, phosphoric acid and sulphuric acid, with the addition of a salt containing nitrogen, in a suitable state. Alumina does not appear to be necessary.

Whether manganese is not indispensable to fructification is still a doubtful point; as much may be said of chlorine, because the rock crystal used as soil always contains a trace of chloride. I intend to solve the question respecting chlorine by an experiment made in pure silver, or even in wax. I shall likewise devote my attention to determining the effects of manganese, also in wax.

I intend shortly to communicate some experiments which I have undertaken on the *summer rape* (a variety of *Brassica campestris oleifera*), a plant which appears to be developed in the same conditions as the oat, if I may judge from preliminary experiments, at least up to the flowering of that plant.

Thus, the principles useful to the oat are suitable for a great number of vegetables, a circumstance which facilitates the researches which have to be undertaken in following out the synthetical method.

It is remarkable that seven inorganic substances suffice to the oat for causing it to bear flowers, and that an eighth (soda and basic phosphate) is required for determining the production of seeds; in a word, for it to accomplish its vegetation as it is necessary that an annual plant should do, that is to say, without putting forth new shoots after having flowered.

I should observe that the nitrates and silicates were dissolved in 15 grammes of distilled water; and after having poured this solution on the artificial soil, the oat seeds were buried up to the point; then water was again added, drop by drop, until

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the soil was perfectly moistened. The rain which shot up best was alone retained; the others were removed.

REMARKS.

No. LXXIX. Carbonate of lime was dissolved in acetic acid, the solution was evaporated to dryness and the residue heated to redness with powdered quartz.

No. LXXX. The carbonate of lime and potassa dissolved together in acetic acid, the residue of the evaporation heated to redness. The same process as regards Nos. LXXXI, LXXXII, and LXXXIII.

No. LXXX. The phosphate of lime was rendered basic.

No. LXXVII. The sand was heated to redness with sulphate of potassa, washed, digested with sulphuric acid and hydrochloric acid and well washed.

[The table concluding this article will be given in our next.]

ON THE EMPLOYMENT OF COLLODION IN PHOTOGRAPHY.

BY MR. BINGHAM.

PHOTOGRAPHY has made rapid progress during the last two years, especially in the methods of operating on paper and glass. We cannot but accord to M. Niepce the merit of having contributed to the perfecting of this art by his beautiful discovery of the process of albumen on glass. The admirable proofs obtained by M. Martens by this means have a beauty of design, a clearness and fineness of detail which leave nothing to be desired. Nevertheless, we cannot conceal the serious inconvenience which this process presents. The length of exposure in the camera obscura necessary for obtaining an image compels us to limit its application to landscapes and architecture, and renounce its employment in portraiture.

I am about to give the details of a process on glass by means of collodion; this process rivals in beauty the albuminised plate, and even surpasses the daguerreotype in sensibility to the light.

In a pamphlet on photography, which I published in London in January, 1850, I mentioned the employment of collodion in photography, and communicated the secret of this discovery to the most distinguished photographers of London: but it is only very recently that all its advantages have been appreciated. The process is very simple; it consists solely in the substitution of a layer of collodion for the albumen of M. Niepce.

No operator accustomed to the manipulations of albumen on glass can fail to succeed with collodion, and to arrive at the best results.

To obtain an image, two or three different methods should be followed, which I will now point out. We shall divide the manipulations into four distinct operations:—

1. The preparation of the collodion.
2. The application of the collodion on the plate.
3. The development of the image.
4. The fixation.

1. PREPARATION OF THE COLLODION.

The collodion is prepared by dissolving gun-cotton in ether; it is necessary that the gun-cotton and ether employed for this preparation should be perfectly pure, that is to say, that they should not contain the smallest trace of sulphuric or nitric acid.

The collodion is more or less fluid, according to the proportions of gun-cotton and ether which are employed. It is only required to be so liquid that, on being poured on to a glass-plate, it shall flow, and be easily spread over the surface. When it is too thick, pure ether is added to it, until the degree of fluidity proper for operating is attained. A few experiments will suffice for arriving at this. When the collodion is too thick, it is difficult to obtain an uniform surface: when it is too fluid its sensibility appears to be very slight.

The collodion is poured into a six-ounce phial, containing fifty-three grains of iodide of ammonium and two grains of fluoride of potassium, with four or five drops of distilled water. The iodide of ammonium should not be entirely dissolved in the water; that is to say, the proportion of water should not be sufficient for making a perfect solution. It is sufficient for the salt to be almost dissolved; the solution is completed by the addition of the collodion.

It is important to pay attention to these details, and for this reason: if too much water is put into the mixture, the layer of collodion will not take well to the plate, and is liable to be detached in the nitrate of silver bath. Agitate the flask once or twice, and allow it to stand until the liquid has become clear and limpid: its color will be of a pale yellow, but if by chance the ether or the collodion retain a trace of acid there will, in that case, be a decomposition of the iodide of ammonia, and the iodine, in being disengaged, will give to the liquid a deep red color.

This method is the most expeditious, but it also presents rather more difficulty than

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that with the iodised collodion which I now describe.

Into a six-ounce phial introduce twelve grains of iodide of potassium and seven or eight grains of iodide of silver; add a few drops of water, but not more than sufficient for dissolving the iodide of potassium; then fill the phial with collodion of the requisite degree of fluidity, agitate once or twice, and leave the mixture to repose for two or three days, until it has become perfectly transparent; it should be almost white, it is ordinarily rather yellow.

2. PREPARATION OF THE PLATE FOR RECEIVING THE IMAGE.

Fix the glass plate on a piece of gutta percha: this substance readily adheres to glass when it is heated; pour on a few drops of ammonia mixed with tripoli, and rub the glass with cotton, describing small circles, as is done with daguerreotype plates; then, with another pledget of cotton, remove the tripoli left on the glass; pour on a second mixture of tripoli and alcohol, and rub as with the first mixture: a few particles of tripoli and fibres of cotton may remain on the glass: to remove these pour on a little pure alcohol, make a very compact pledget, so that the fibres of cotton may not project, and rub the plate with the greatest care; finally, rub for the last time with a new dry pledget. It is ascertained that it is fit to be employed when, on breathing on it, the moisture condenses uniformly over the whole surface. Always holding the plate by its handle of gutta percha, gently pour the collodion on it, and incline it from side to side, in order that the liquid may run into the corners; then pour the excess of liquid, by one of the corners, into the phial. The plate will then appear to be covered with very fine groves, all perpendicular in the direction of the flowing; by inclining it in another direction, the grooves will be obliterated, and the layer will become thin and uniform. Then, before the collodion has time to dry, the plate is introduced into a bath of nitrate of silver, the prepared surface being held downwards.

This bath should contain forty grains of nitrate of silver to each ounce of distilled water. The surface of the plate will not be wetted immediately; a certain time is required for the ether to become mixed with the water; the plate is therefore allowed to remain in the bath at least half a minute without allowing it to touch the bottom of the vessel, and supporting it by the aid of a silver or platinum hook.

As soon as it is perceived that the plate is covered with a whitish uniform layer, and that the water has flowed well over its surface, it is removed and placed immediately in the frame of the camera obscura: it must be used within ten or fifteen minutes—the sooner the better.

DEVELOPMENT OF THE IMAGE.

Place the glass on a support, and quickly pour on the surface a solution composed of two parts of pyrogallic acid, sixty parts of glacial acetic acid, and five hundred parts of water. If the exposure in the camera obscura has not been sufficient, a few drops of nitrate of silver may be added, but ordinarily this is not necessary.

As soon as the image is perfectly developed, which takes about two minutes, it is washed with a current of water, and then it is fixed by pouring on a saturated solution of hyposulphite of soda. The layer of iodide of silver disappears, and the image is perceived, which sometimes is positive: it is then washed in a large quantity of water to remove all the hyposulphite; the plate is then dried either over a lamp or spontaneously in the air; before drying the layer is very tender; afterwards it becomes hard and adheres to the glass like albumen.

By means of this process, it would be easy, if desired, to obtain at once a positive image of great beauty, and possessing much more force and purity than those of the daguerreotype, and not having, like the latter, the inconvenience of a reflection which prevents them from being seen except in a certain position. To obtain this result, the exposure in the camera obscura should be much shorter than for a negative proof; but it is also necessary to allow this image, which we desire to make into a positive, to remain in a solution of pyrogallic acid, with one or two drops of nitrate of silver.

Then the luminous parts are formed of white layers having the same character as the crystalline layers formed by the mercury in the daguerreotype process.

When the positive image is quite developed, it is fixed by the same means as the negative.

I must add, in conclusion, that the time generally necessary for obtaining a good negative in the shade with an ordinary German object-glass is from two to three seconds, or less than half the time requisite for obtaining the same result with the daguerreotype.—*Comptes Rendus*, No. 19, May 11, 1852.

MIXTURES FOR COLORED FIRES.

BY PROF. MARCHAND.

THE following recipes for the preparation of mixtures for colored fires were found

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among the posthumous papers of the late Prof. Marchand. The materials are rubbed to a fine powder separately, and then mixed with the hand :—

Red.

61 p. c. chlorate of potassa.
16 sulphur.
23 carbonate of strontia.

Purple-red.

61 p. c. chlorate of potassa.
16 sulphur.
23 chalk.

Rose-red.

61 p. c. chlorate of potassa
16 sulphur.
23 chloride of calcium.

Orange-red.

52 p. c. chlorate of potassa.
14 sulphur.
34 chalk.

Yellow.

61 p. c. chlorate of potassa.
16 sulphur.
23 dry soda.

or,

50 p. c. nitre.
16 sulphur.
20 soda.
14 gunpowder.

or,

61 p. c. nitre.
17½ sulphur.
20 soda.
1½ charcoal.

Light Blue.

61 p. c. chlorate of potassa.
16 sulphur.
23 strongly-calcined alum.

Dark Blue.

60 p. c. chlorate of potassa.
16 sulphur.
12 carbonate of copper.
12 alum.

Dark Violet.

60 p. c. chlorate of potassa.
16 sulphur.
12 carbonate of potassa.
12 alum.

Pale Violet.

54 p. c. chlorate of potassa.
14 sulphur.
16 carbonate of potassa.
16 alum.

Green.

73 p. c. chlorate of potassa.
17 sulphur.
10 boracic acid.

Light Green.

60 p. c. chlorate of potassa.
16 sulphur.
24 carbonate of baryta.

For Theatrical Illumination.

White.

64 p. c. nitre.
21 sulphur.
15 gunpowder.

or,

76 p. c. nitre.
22 sulphur.
2 charcoal.

Red.

56 p. c. nitrate of strontian.
24 sulphur.
20 chlorate of potassa.

Green.

60 p. c. nitrate of baryta.
22 sulphur.
18 colorate of potassa.

Pink.

20 p. c. sulphur.
32 nitre.
27 chlorate of potassa.
20 chalk.
1 charcoal.

Blue.

27 p. c. nitre.
28 chlorate of potassa.
15 sulphur.
15 sulphate of potassa.
15 ammonio-sulphate of copper.

The dark blue is rendered still darker by the addition of some sulphate of potassa and ammonio-sulphate of copper.—*Journ. für Prakt. Chem.*, lv. p. 250.

ON DYEING WITH SANDAL-WOOD.

BY ANTON WIMMER.

In order to dye as fine a red with sandal-wood as with madder, the author first exhausts the wood with boiling water. He then treats it with a cold filtered solution of chloride of lime as long as this becomes colored, and washes it perfectly with pure water. From the sandal-wood, thus prepared, the red coloring matter is extracted by a hot, but not boiling, solution of soda, the wood being tied up in a linen bag; the kettle is to be covered with a well-fitting lid. The extract should have a deep red color, with a violet tint. Cotton, linen, and woollen stuffs are prepared with acid mordants, and dyed with it in the usual manner. The author obtained a beautiful scarlet by alter-

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nately treating the stuffs with a mordant of chloride of zinc and the above bath. The colors are durable, and particularly useful in saving cochineal, as stuffs which are to be dyed with cochineal may previously receive a ground of the coloring matter of sandal-wood.—*Kunst and Gewerbebl. für Baiern*, 1852, p. 149.

PROCESS FOR GIVING VARIOUS OBJECTS A PEARLY LUSTRE.

BY O. REINSCH.

To produce the iridescence of mother-of-pearl on stone, glass, metal, resin, paper, silk, leather, &c., Reinsch adopts the following process:—2 parts of solution of copal, 2 parts of that of sandarach, and 4 parts of solution of Damara resin (equal parts of resin and absolute alcohol) are mixed with half their volume of oil of bergamot or rosemary. This mixture is to be evaporated to the thickness of castor oil. If this varnish be then drawn by means of a feather or brush over the surface of some water, it will form a beautifully iridescent pellicle. This film is now to be transferred to the objects which are to be rendered iridescent. The vessel in which the water is contained, on which the pellicle has been produced, must therefore be as large as, or larger than, these objects. The water should have about five per cent. of pure solution of lime added to it; its temperature should be kept at about 72°. The objects are dried in the air.—*Ibid*, p. 165.

ON GUTTA TABAN.

BY BERTHOLD SEEMANN.

THE Taban (*Isonandra Gutta*, Hook), which was formerly so plentiful (in Singapore), has long since been extinct. A few isolated trees may here and there occur, but they are very scarce, and I have not been able to obtain even the sight of one. Several of the white residents keep in their gardens, as a curiosity, a plant or two, but they grow very slowly. It must ever be an object of regret, that on the first introduction of the Taban gum, its proper name was not promulgated. Now everybody in Europe and America speaks of Gutta Percha, when, in fact, all the time they mean the Gutta Taban. The substance termed by the Malays "Gutta Percha" is not the produce of the *Isonandra Gutta*, Hook., but that of a botanically unknown tree, a species of *Ficus*, I am told. The confusion of these two names has become a popular error—an error which science will have to rectify.

The exportation of the indigenous Gutta Taban from Singapore commenced in 1844, but as early as the end of 1847, all, or at least most, of the trees had been exterminated. That at present shipped from the place is brought in coasting vessels from the different ports of Borneo, Sumatra, the Malayan peninsula, and Jahore Archipelago.* The difference existing in its appearance and property is owing to the intermixture of Gutta Percha, Jelotong, Gegrek, Litchu, and other inferior Guttas, made by the natives in order to increase the weight. Though far from being extinct in the Indian Archipelago, Gutta Taban will every year be more difficult to obtain, as the coast region is said to be pretty well cleared, and a long transport from the interior must, by augmenting the labour, increase the value of the article.

A few months after the publication of your first account of the plant, in January, 1847, an article on the same subject appeared in the *Journal of the Indian Archipelago*, by one of its most able contributors, Dr. T. Oxley. As that article contains many statements not contained in yours, and as it may possibly have escaped your notice, I shall make a few extracts from it:—

"The Gutta Taban tree belongs to the natural order *Sapotaceæ*, but differs so much from all described genera, that I am inclined to consider it a new one. I shall, therefore, endeavour to give its general character, leaving the honor of naming it to a more competent botanist, especially as, from want of complete specimens, I have not quite satisfied myself regarding the stamens and fruit.

* "The total export of Gutta Taban from Singapore has been:—

In 1844	1	picul
In 1845	169	..
In 1846	5,364	..
In 1847	9,296	..
In 1848 to the 1st of July	6,768	..
Total	21,598	piculs

valued at 274,190 Spanish dollars. About 270,000 trees have probably been felled during the three and a half years that the trade has existed, and the value of each tree has thus on an average been about a dollar."—J. R. Logan, "*On the Range of the Gutta Taban Collectors, and present Amount of Import into Singapore.*" Mr. Logan has promised an article on the various substances intermixed with the Taban, a subject of the highest interest; but he has hitherto disappointed his readers.

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"The tree is from sixty to seventy feet high, from two to three feet in diameter. In its general aspect it resembles the Durian (*Durio Zibethinus*, Linn.), so much so as to strike the most superficial observer. The leaves are alternate, obovate-lanceolate, entire, coriaceous, their upper surface is of a pale green, and their under surface covered with a close, short, reddish-brown hair; the flowers are axillary, from one to three in the axils, supported on short curved pedicels and numerous along the extremities of the branches. The calyx is inferior, persistent, coriaceous, divided into six sepals, which are arranged in double series. The corolla is monopetalous, hypogynous, and divided, like the calyx, into six acuminate segments. The stamens, inserted into the throat of the corolla, are in a single series, and variable in number, but, to the best of my observation, their normal number is twelve; they are most generally all fertile. The anthers are supported on slender bent filaments, and open by two lateral pores. The ovary is superior, terminated by a long single style, and six-celled; the cells are monospermous. The fruit is unknown to me.

"Only a short time ago the Taban tree was tolerably abundant on the island of Singapore, but already (middle of 1847) all the large timber has been felled. Its geographical range, however, appears to be considerable, it being found all up the Malayan peninsula, as far as Penang, where I have ascertained it to be plentiful. Its favorite localities are the alluvial tracts on the foot of hills, where it forms the principal portion of the jungle.

"The quantity of solid gutta obtained from each tree, varies from five to twenty catties, so that, taking the average of ten catties, which is a tolerably liberal one, it will require the destruction of ten trees to produce one picul. Now, the quantity exported from Singapore to Europe, from the first of January, 1845, to the middle of 1847, amounted to 6918 piculs, to obtain which, 69,180 trees must have been sacrificed! How much better would it be to adopt the method of tapping the tree practised by the Burmese in obtaining the caoutchouc, than to continue the present process of extermination."*

A mercantile house in Singapore lately received from Manilla a gum which was supposed by those who sent it to be Gutta Taban, but proved a different substance. It was accompanied by specimens of the tree producing it, and a note stating that the gum abounded in the Philippine Islands. As it will probably make its appearance in England, and perhaps become of some importance, I may add that those specimens presented to me by the merchant, belong to the genus *Ficus;* but whether to a new or an already described species, want of books prevented me from determining.—*Hooker's Journal of Botany.*

* T. Oxley, in the *Journal of the Indian Archipelago*, vol. i., p. 22-30.

FORGERY OF STAMPS AND THE BOARD OF INLAND REVENUE.—MODE OF TAKING IMPRESSIONS.

(From the *Mechanic's Magazine.*)

Sir,—Will you be so kind as to allow me a few words, not altogether, perhaps, foreign to the purpose of your publication.

Some time ago I accidentally discovered a mode by which the raised impressions of receipt stamps may be taken with great facility, and so perfectly as not to be detected from the original. Thinking the matter of some importance, I wrote to Lord John Russell, inclosing specimens of the impressions I had taken from stamps. His Lordship immediately forwarded my communication, with the specimens, to the Board of Inland Revenue. The Board, after some delay, condescended to reply; but in terms so official, starched, and insolent, that one would have thought that I had committed some high crime, rather than simply to have submitted information which was thought to be useful. The Board almost promised me transportation for my pains. I replied in my turn, and justified myself for what I had done: further, I wrote to the head of the department, Sir Charles Wood, informing him of what had taken place, reminding him that, if the information contained in my communication to Lord John Russell were of no use to the Board, it might be to the country, and that I should take an early opportunity of publishing the *modus operandi*, which, I should have observed before, I offered to show the Board; and at their own Board-table, if they pleased, I offered to take an impression from any stamp they might choose. Sir Charles returned me no answer.

Now, Sir, do not suppose that I troubled myself with being angry at what may be called scurvy treatment; if I have any feeling in the matter, it is that of supreme contempt for the little-headed group composing the Board. But enough of this; I ought not to have obtruded myself within the "wind of their nobility;" I ought to have remembered the Board of Admiralty

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and Admiral Napier, and the Board of Customs and the merchants of the city of London.

Now to my point, Sir. All impressions on paper, whether raised or sunk, is open to forgery by one person without the least trouble or risk. I do not mean to say that I alone am in possession of this fact; perhaps not. But I do think the country should know the secret, if it may be so called; besides, in many workshops the process may be useful, and straightforward simplicity take the place of more roundabout contrivances by its publication.

METHOD.

To take exact impressions of stamps, or, in fact, of any device, raised or imprinted, that is, sunk on paper, cut a piece of cardboard, say to the breadth of half an inch, with which form a ring just the dimension of the impression to be taken; then pour within the said ring, which surrounds the spot, melted fusible metal: the carding will prevent the metal from running away, and in a few minutes it will cool and take the impression, without the slightest injury to the paper from which it was taken. I need not say that the impression, &c., taken *must be the same as the original.*

Fusible metal, according to Brande, is a compound of eight parts of bismuth, five of lead, and three of tin, which liquefies at 212°, and below that if one part of quicksilver is added.

I am, Sir, yours, &c.,
HY. BROWN.

187, Whitechapel-road.

REMARKS UPON THE ALLEGED USE OF STRYCHNINE IN THE MANUFACTURE OF BITTER BEER OR PALE ALE.

BY BARON LIEBIG.

(*In a Letter addressed to Henry Allsopp, Esq., Burton-on-Trent.*)

THE unguarded remark of a French chemist, that the strychnine imported into England is employed in part as a substitute for hops in the manufacture of beer, has lately spread alarm among the lovers of pale ale. Having been appealed to by you to express my opinion on this subject, which appears to me to be, in a dietetic point of view, one of considerable public interest, I now offer the following brief statement:—

About a quarter of a century ago, a brewer in Westphalia fell into the practice of adulterating his beer with *nux vomica*, from which it is well known that strychnine is obtained. The peculiar morbid symptoms, however, which resulted from the consumption of this adulterated beer, speedily led to the detection of the fraud. The effects produced by *nux vomica* and strychnine are so characteristic, that every medical man will readily detect their origin. The French novelist, Alexandre Dumas, has described them, though with more imagination than truth, in his romance of "Monte Christo." It is possible that the Westphalian case, which, from being made the subject of a criminal trial, obtained great notoriety, has given rise to the assumption that in England the strychnine imported is used for the purpose of mixing with beer. But nobody at all acquainted with the great breweries of that country could seriously entertain the suspicion of an adulteration of beer with strychnine or any other deleterious substance. It is practically impossible that any operation of a doubtful character could be carried out in these extensive establishments, on account of the large number of workmen employed in them. Any attempt on the part of the brewer to impart qualities to his beer in an illicit manner, which are not to be obtained from malt or hops, would necessarily lead to his ruin, as he would be obliged to communicate his secret to too many persons, and to employ too many accomplices. The draymen themselves, as good connoisseurs in beer, would protest against any manipulation of a suspicious character. The case has even occurred of an eminent brewer not venturing to make use of a method suggested to him, for the purpose of clearing his beer more effectually, because the addition of a new material to the wort might have induced a suspicion in the minds of his workmen that it was an illicit proceeding, and this would have endangered the good reputation which his beer enjoyed. He stated to me, at the same time, that no improvement could be introduced into a brewery, the object of which was not perfectly evident to everybody.

During a sojourn of several days at Burton-on-Trent, I had an opportunity of becoming intimately acquainted with the method pursued in the manufacture of pale ale. I convinced myself that the qualities of this excellent beverage depended mainly upon the care used in the selection of the best kinds of malt and hops, and upon the ingenuity exhibited in conducting the processes of mashing and fermenting. Our continental brewers have much to learn in these points to come up to the English brewers. I have no hesitation in saying that England possesses the greatest adepts

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in malting. I know positively that the chief brewers of Munich, who undoubtedly produce the best beer in Germany, have gone through an apprenticeship in Burton. This may account for the predilection entertained by the general public, as well as by medical men, for these varieties of beer; for the instinct of humanity and experience appear to be as good guides in the choice of things that contribute to health and enjoyment as the profoundest philosophy.

Professors Graham and Hofmann, in the excellent report already addressed to you upon the alleged adulteration of the pale ale by strychnine, have indicated a very simple process for detecting the most minute quantity of strychnine contained in beer. I have satisfied myself of the great convenience and accuracy of their method, and have farther assured myself, by an analysis of several specimens of pale ale obtained from London houses, supplied by your establishment, of the utter groundlessness of the imputation, that this beer was poisoned with strychnine. I am positive, and am supported in my views by the concordant analyses of all chemists who have occupied themselves with the examination of beer, that the poisoning of pale ale with strychnine has never occurred. I believe I may safely add, that it never will take place; for although an ignorant brewer might be induced, from interested motives, to add *nux vomica* to his beer, the word strychnine so forcibly suggests one of the most virulent poisons, that whoever has heard anything about strychnine at all, is sure to be aware of this. By adulterating his beer with strychnine, the brewer would be knowingly committing a crime which, in the present state of science, must be followed by immediate detection and punishment.

Mr. E. Merck, of Darmstadt, one of the most extensive strychnine manufacturers in Europe, informs me that this substance is peculiarly adapted to destroy vermin of all kinds. In many parts of Germany it is the popular poison for rats and mice. This fact fully accounts for the large amount of the drug that has lately been introduced into commerce.

The specimens of your pale ale sent to me have afforded me another opportunity of confirming its valuable qualities. I am myself an admirer of this beverage, and my own experience enables me to recommend it, in accordance with the opinion of the most eminent English physicians, as a very agreeable and efficient tonic, and as a general beverage both for the invalid and the robust. JUSTUS LIEBIG.

Giessen, May 6th, 1852.

[We have much pleasure in expressing our approbation of the honest and manly course pursued by Messrs. Allsopp, who have caused a most searching investigation to be made as to the genuineness of their bitter ale. From personal experience and ample opportunity of judging, we have no hesitation in saying that the ale brewed by Messrs. Allsopp is quite free from any adulteration, and we have every confidence that as much may be said of the other large brewers at Burton. Mr. Henry Allsopp is entitled to the thanks of his brethren for the satisfactory course he has taken: the public likewise must be grateful to him for having restored to confidence and favor a beverage so highly and deservedly esteemed.]

ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.

Improvements in treating sewage, in obtaining products therefrom and in combining such products with other matters. RICHARD DOVER, of New-street, Spring-gardens, Merchant. Patent dated October 16, 1851.

These improvements consist in deodorizing putrescent sewage by the addition of muriatic or other similar mineral acid, with a salt or salts, or other chemical compounds, and in applying the solid products to the manufacture of manure by combining the same with fertilizing matters.

The acid which the patentee prefers to use is muriatic (otherwise called hydrochloric) acid, which he adds to the sewage water in the proportion of 5½ lbs. to every ton, with chloride of sodium in the proportion of 3 ozs. to the ton, and protosulphate of iron 6 ozs. to the ton. In lieu of using chloride of sodium, other chlorides, as of potassium, magnesium, and calcium, may be employed, and in place of the protosulphate of iron, the sulphate of peroxide of iron and other salts which are capable of having their bases separated or precipitated from the acids with which they are combined by the action of the chemical constituents of sewage may be used. In addition to the above-named salts, there is also added to the sewage under treatment a small portion of protochloride, otherwise called muriate of iron. These several matters having been mixed together, are added to the sewage, and having been combined therewith by mixing, the whole is filtered to obtain the solid portions. These are then mixed with marl or other substances, and applied as manures, or the substances employed as

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filtering beds, such as charcoal, gypsum, or peat may be mixed with the solid portions for producing fertilising compounds. The solid matters may be treated with chemicals to obtain products therefrom, and the liquids passing through the filters may be similarly treated to obtain the ammoniacal salts contained in them.

Improvements in apparatus for holding and drawing off aërated liquors, and in machinery for filling vessels with aërated liquors. FRANCOIS MARIE LANOA, of Paris. Patent dated November 3, 1851.

1. The patentee describes an improved syphon, tap, or stopper for aërated liquor-bottles, in which a passage is opened for the escape of the fluid by pressing down, by means of a screwed cap, a valve in the centre of the stopper. A spring is coiled round the stem of this valve, to bring it back and close the passage when the pressure of the cap is removed; and suitable provision is made for the escape of air when the vessel is being filled, by the downward motion of the valve unclosing an aperture in the neck of the stopper.

2. For filling bottles, the patentee applies a modification of the arrangement just mentioned to vessels capable of containing a large quantity of aërated fluid, which he draws off into bottles.

Claims.—1. The mode of pressing the valve of the stopper by means of a cap or cover, and also the apparatus for allowing the air to escape from the vessel when filling.

2. The apparatus for filling vessels with aërated liquors.

Improvements in obtaining nickel and cobalt. (A communication.) HENRY HUSSEY VIVIAN, of Singleton, Glamorgan. Patent dated November 4, 1851.

It is well known that all copper ores, foreign as well as British, contain a certain proportion of nickel and cobalt, or one of these metals, which as the ores are at present treated, goes entirely to waste. Now the object of the present invention is to separate the nickel and cobalt from the copper, and obtain them in the form of arsenurets in a marketable state. This object the patentee effects by availing himself of the affinity of copper for sulphur, and of nickel and cobalt for arsenic.

The process adopted is divided into two steps or branches. The first of these varies according to the nature of the ores or compounds of copper operated on, which may be divided into four classes. The first class comprises ores, slags, and other compounds containing copper and other metals, chiefly in an oxidised state. These the patentee treats by the addition of a sufficient quantity of arsenical pyrites to combine with the whole of the nickel and cobalt present, together with a portion of the copper, sufficient sulphur in the state of iron pyrites, or raw ore furnace metal, to combine with the remaining portion of copper, to form a regulus and coal to facilitate the reduction of the oxides. These several matters are melted together, tapped out of the furnace, and when the slag has been skimmed off, and the pigs are cool, the nickel and cobalt will be found to have combined with the arsenic to form an impure arsenical compound, which settles to the bottom of the pigs, and is removed for treatment by the second part of the process. If all the nickel and cobalt are not separated, the regulus may be melted again, and the melting repeated as often as may be found necessary. The quantities of arsenic and sulphur, which should never be used in their free state, will, of course, vary with the ores to be operated on. The following proportions, however, have been found to answer when treating oxides of copper produced by calcining regulus of copper of 70 per cent., 8 cwt. arsenical pyrites, 12 cwt. raw ore furnace metal, of about 30 per cent. sulphur, and 2 cwt. of coal to every 20 cwt. of oxide.

The second class consists of copper ores and regulus containing small quantities of nickel and cobalt not in an oxidised state. These the patentee smalts in the usual manner until the product is a regulus of about 70 per cent. (commonly known as "white metal,") he then roasts the regulus, as would be done for producing a metallic bottom, and on the completion of the first stage of the roasting process, and prior to melting for tapping, he adds 3 to 5 cwts. of arsenical pyrites for every 30 cwts. of regulus, then melts and runs the product into a sand bed. On lifting the pigs, when cold, a metallic bottom will be found under the first three or four, containing the principal portions of the nickel and cobalt in a concentrated state.

The third class comprehends copper ores, or regulus containing large quantities of nickel and cobalt, and not in an oxidised state. In such ores there is generally present a large quantity of arsenic, which is sufficient to combine with the nickel and cobalt, but if not, more arsenic will have to be added. This being the case, the patentee melts these ores or regulus in the usual way adopted for copper smelting; but instead of running the product into water to granulate, he casts it into pigs, and obtains a metallic

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bottom from the pigs, which will be found to contain nearly all the nickel and cobalt.

The fourth class consists of cupreous alloys. These the patentee treats by adding them to either one or other of the charges of the first three classes when about to be melted, and melting them therewith, or by granulating the alloys, adding arsenical pyrites, and proceeding as directed for ores of the first class.

The products of each of the above operations, or of all of them, are finally treated to obtain the arsenurets of cobalt and nickel in a marketable state, by reducing the impure arsenical compounds to powder, calcining and melting, with the addition of further quantities of arsenic, sulphur, and silica. These materials are introduced for the purpose of separating the nickel and cobalt, and converting the copper, lead, silver, antimony and other metals to regulus, and the iron, of which there is always a certain quantity present, to slag. Of the arsenic, which is added in the state of arsenical pyrites, 10 cwts. are used to every 70 cwts. of materials to be treated; of the sulphur, in the state of sulphate of barytes, 8 cwts.; and of the silica, 12 cwts. These materials are melted together; the slag containing the iron is skimmed off, and the remaining product is then tapped into beds; and from the pigs thus formed, when cool, the regulus is removed, and treated in the usual way to obtain its copper and other metallic constituents, while the metallic bottom of the pigs containing the arsenurets of nickel or cobalt is separated from the regulus in a state of sufficient purity to be marketable. Should this not, however, be the case, they may be subjected to successive meltings and treatments, as just described, until sufficiently purified.

Improvements in preparing wood to prevent its warping or shrinking. CLAUDE FRANCOIS TACHET, of Paris. Mathematical instrument maker. Patent dated November 15, 1851.

The ordinary method of preparing wood to prevent its warping or shrinking, is to employ two or more thin pieces which are united together with the grain laid crosswise, by means of glue or liquid cement, but this mode only partially answers its intended purpose, as glue, or cement, applied in a liquid state is always liable to be affected by a moist atmosphere, and the expansion produced thereby, and the subsequent unequal contraction in drying causes a certain amount of warping. Now the object of the patentee is to unite pieces of wood together, so as to render them independent of atmospheric influences, and this he effects by employing the cement in a dry and powdered state, and applying heat to the exterior of the pieces of wood to be united, so as to effect the melting of the cement by transmission. The cement which the patentee employs is gum lac, alone or in combination with other materials. This he reduces to a powder, and sprinkles evenly over the surface of one of the pieces of wood to be united. He then lays the other piece of wood on the cement-covered surface, and repeats the process of sprinkling cement and applying thicknesses of wood according to the ultimate required thickness to be produced. He then clamps the pieces of wood together and applies sand heated to about 300° centigrade to the exterior surfaces, and continues this application of heated sand until the cement is melted, when the sand is removed and the air admitted to cool the wood and set the cement. When quite cold the prepared wood is removed from the clamping-press, and may then be applied to any useful purpose. The patentee describes an arrangement of apparatus for sprinkling the cement and for heating and applying the sand to be employed for melting the same—and claims,

1. The application of an adhesive substance in a state of powder between the surface of shuts or pieces of wood to be united, and the softening and fusing the same by the application of transmitted heat through the thickness of the wood for preserving the same from warping and shrinking.

2. The application of the apparatus for effecting the sprinkling and fusion of the adhesive matter.

3. The apparatus for filling the boxes or drawers with heated sand.

Certain improvements in the process of, and apparatus for treating fatty and oleaginous matters, and in the manufacture of candles and other useful articles therefrom. WILLIAM ARMAND MOREAU GILBEE, of South-street, Finsbury, gentleman. (A communication.) Patent dated November 22, 1851.

Claims.—1. The application of sulphurous acid to the direct acidification of neutral fatty bodies.

2. The mixture of a sulphite with a calcareous soap before its decomposition by means of sulphuric acid, especially when the latter contains azotous acids.

3. The application of sulphurous acid gas during the production of calcareous soap.

4. The heating of distilling apparatus by means of the circulation of a liquid carried

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to a high temperature in tubes, or by means of over-heated steam circulating in an envelope surrounding the bottom of the still, and then injected within the distilling fatty body.

5. Two processes for super-heating steam in metallic baths.

6. The application of a new construction of pyrometre to apparatus for distilling fatty bodies.

7. A process of extracting paraffine [from peat, schistus, &c.,] and of purifying the same [by the aid of oleic acid].

8. A mode of operating and applying the liquid extracted from cocoa-nut oil.

9. A mode of treating castor and "ricinous" oils, and their transformation—1, Into sebacic acid to be mixed with candles; 2, Into a new alcohol; and 3, Into a new fatty acid.

10. A mode of heating the moulds of luminaries.

11. A peculiar construction of candle-mould frame.

12. An apparatus for unmoulding candles.

13. Four apparatuses and processes, whether used in combination or singly, for treating fatty or oleaginous matters, together with certain new combinations of chemical agents.

14. The application of argillaceous and other similar earths in the treatment of fatty and oleaginous bodies.

Improved modes of applying electro-chemical action to manufacturing purposes. RICHARD ARCHIBALD BROOMAN, of the firm of J. C. Robertson and Co., of 166, Fleet Street, patent-agents. (A communication.) Patent dated Dec. 8, 1851.

The nature of this invention consists in the application of chemical, electro chemical, thermal, and galvanic forces, separately or combined, and under circumstances already to some extent understood and recognised, as well as under certain new and peculiar conditions.

The improvements are applicable to the manufacture and preparation of organic and inorganic substances belonging to the animal, vegetable and mineral kingdoms, and to the manufactured products thereof, and consist in subjecting them to an electric or galvanic current, which may be produced by chemical combination or decomposition, by sudden or gradual changes of temperature, by galvanic or electrical apparatus, or by a combination of any of these agencies.

"I make use of a battery or pile, which I construct in a peculiar and novel manner. The usual apparatus now in use consists, for the most part of plates or portions of two different metals, arranged in pairs so that at each end of the series two different metals are found. Thus a battery or pile of six cells, or six pairs of plates, having zinc and copper for its metals, would consist of zinc and copper alternately, commencing with one and terminating with the other. On the contrary, I arrange the metals of my battery or pile so that the same metal marks the commencement and termination of the series. In each pile or battery I have also an odd number, the central plate constituting one of the poles; or the two central plates are of the same metal, and united together.

The drawings show a pile or battery of fourteen cells. The metals employed are zinc and copper. By my peculiar arrangement the metal zinc commences and terminates the series, while the two central cells are occupied by a pair of copper plates instead of plates of zinc and copper. These two copper central plates represent one of the poles of the battery or pile, and are, in fact, the receptacles of the electric forces proceeding from the two extremities.

The form of my battery or pile may be varied, as well as the material of which it is constructed. Thus a battery or pile may be formed by the union of a number of such batteries as described, terminating in one common central cell.

The usual acid or saline solutions now employed in the common batteries may be applied to mine as well.

The same novelty of arrangement, as far as metals are concerned, which I have introduced into my pile or battery I apply to the construction of wires intended for the conduction of electricity, by which means I obtain a more perfect degree of insulation. The same principle is also applicable to the preservation of metals from oxidation or corrosion, or, in other words, to the galvanisation of metals.

I may mention that my battery may be constructed with cylinders as well as with plates and cells.

Having thus described my improvement in the construction of a pile or battery, I now proceed to explain other portions of the invention.

Electro-chemical force, accompanying combination and decomposition, may be employed with great advantage in the treatment of vegetable bodies—as, for example, in the fertilisation of seeds. Thus, to produce rapid and healthy germination, I steep the seed in some compound, such as carbonate of potassa, or in some suitable alkali. I then transfer it to a bath of weak acid, by

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means of which the carbonate of potassa is decomposed, and carbonic acid set free. I can use any acid, but I prefer such as phosphoric or nitric, because they unite with the alkaline base to form fertilising salts.

On the contrary, to preserve vegetable materials, such as seeds, tissues, or fibres, I endeavor to set up the law of simple combination within them, avoiding the slightest decomposition. Thus, by dipping seed or any vegetable matter in a weak acid, and then in some basic hydrate for which that acid has an affinity, I retard or prevent entirely germination, fermentation, or eremacausis. In setting up this electro-chemical action, I generally choose such acids and bases which, when united, form well-known antiseptic salts or compounds. This process differs very materially from all others where antiseptics are used, inasmuch as I form the compound within the materials sought to be preserved. Thus, for example, to preserve fishing-nets, I dip them first in some suitable acid, such as tannic acid, and then in some hydrate, such as soda, lime, magnesia, or alumina. To preserve animal matter, such as meat, I adopt the same principle, forming the antiseptic compound in the meat itself. The same process, or one analogous to it, I employ for the prevention of disease in potatoes. Also to deodorise materials such as sewage matter, &c., I produce in them certain antiseptic compounds, such as before mentioned.

To preserve membranous substances, such as skins and hides, I likewise cause the tannic acid, or other suitable acid, to combine with a suitable base within the tissues of the skin. In preserving skins by means of these tannates, I prefer the employment of some base like magnesia, which, when combined with tannic or catechuic acid, does not discolor the material.

By forming within the tissues and fibres of paper, cloth, &c., certain salts, such as sulphate of alumina, chloride and borate of zinc not only preserve them, but render them less combustible.

I produce two very opposite effects by the peculiar method in which I set up the electro-chemical action, to which reference has been made, or, in other words, according to the direction in which I cause the electric force to pass. Thus, if I merely produce chemical combination within the substance by the simple union of two bodies, such as an acid and a hydrate, and especially if that hydrate be potassa or soda, I produce an effect similar to milling or fulling; but, on the contrary, if I establish decomposition within the fibre or fabric whether by the usual method of decomposing a carbonate by an acid, or by fermentation, I cause an expansive effect to occur.

By forming within the fibres or fabrics certain salts insoluble in water, and then exposing them afterwards to decomposition by some suitable agent, I produce a singular cleansing and bleaching effect, dependent, I believe, upon the establishment of electrical currents during the solidification or crystallisation of the insoluble salt and its after solution. For example, if I saturate flax in a solution of sulphate of magnesia, and then dip it into a liquid holding dissolved in it an amount of carbonate of soda, an insoluble carbonate of magnesia is formed within the fibre itself. On immersing this in weak sulphuric acid, the carbonate of magnesia is decomposed, sulphate of magnesia is again formed, and at the same time coloring matter is removed to a considerable extent.

For the purpose also of cleaning and purifying saccharine syrups, oils, and fats, I use, for example, a solution of sulphate of magnesia, and then add lime-water. In this way two insoluble bodies are formed, and in addition to the electrical action set up, the mechanical effect of the insoluble matter will be to carry down to the bottom of the vessel certain impurities. In some cases I prefer the use of acetate of magnesia, precipitating the magnesia afterwards by the use (for example) of free carbonic acid passed into the syrup or oily matter. I also employ the acetates of such metals (lead excepted) the bases of which can be precipitated and removed by filtration, such, for example, as the acetates of lime, baryta, strontian, &c. I also employ for the purification of saccharine matters, and of fatty hydrocarbons, certain insoluble compounds of boracic acid with a metallic base, combining them in the material to be purified.

Metals may be rendered harder or softer also by means similar to those which have already been described. Remarkable changes are produced in iron by the formation in contact with it of the carburet of magnesium, for example, as well as by the production or decomposition of water, and of other compounds in a like situation of contact. The conversion of iron into steel is much promoted by the action of carburet of magnesium.

I apply also the same principle in the preparation of hydraulic cements, and for the purpose of hardening certain minerals, and soft, porous stones.

Thus, in preparing a hydraulic cement, I add to the usual materials certain proportions of alum, lime, and soda-ash, by which

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means I obtain alumina, and a mixture of carbonate and sulphate of lime and of soda. The soda is easily removed by the action of water.

To harden soft, porous minerals, I use (for example) chloride of calcium and sulphate of magnesia, by which means I impregnate the stone with sulphate of lime, from which the chloride of magnesium is easily removed by water; but I can use any materials which will form within the stone or mineral an insoluble compound. For this purpose I sometimes employ soluble silicates, from which within the stone, I precipitate the insoluble silica. I also throw down in the materials to be operated on certain insoluble borates, such as the protoborate of iron, &c.

To obtain basic zinc for painting purposes, I propose to obtain carbonate, borate, or chloride of zinc by the process of double decomposition. Thus, to obtain the carbonate, I react on sulphate of zinc by means of carbonate of soda or some similar carbonate. After the insoluble carbonate has been precipitated, I wash out and collect the sulphate of soda. If it is necessary, I now expose the carbonate of zinc to heat. In preparing certain animal fibres, such as silk for spinning and dyeing, I find it of great importance to boil or steep first in some carbonate, such as carbonate of soda, potassa, or ammonia, and then to steep it in some weak acid; and for this purpose sour rice-water or starch-water is useful. Boiling or steeping silk also in a solution of biborate of soda, and then the treating with a weak acid, as before, will be found efficient.

And having now described the nature of the said invention, and in what manner the same is to be performed, I declare that I claim the improvements in the application of electro-chemical action to the purposes hereinbefore described.

III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

PREPARATIONS OF IRON AND MANGANESE.

BY M. BURIN DU BUISSON, PHARMACEUTIST AT LYON.

CITRATE OF MANGANESE.

To obtain this salt, take

Citric acid . .	100·0
Distilled water . .	1000·0
Humid proto-carbonate of manganese .	q. s.

Dissolve the acid in the water at a temperature of from 176° to 194° F., and add the carbonate of manganese by degrees until it ceases to dissolve. Then decant the liquid quickly to separate the undissolved carbonate, and evaporate it to a pellicle. On cooling, the citrate of manganese is deposited under the form of small granular crystals of a pinkish white. The acid mother liquor is decanted, which will again give a certain quantity of salt by a new evaporation: the salt is washed with distilled water and dried in a stove.

The atmosphere has no action on this salt. Cold water only dissolves traces of it; boiling water scarcely dissolves one per cent. of its weight; the solution has a slightly inky taste. In the dry state it has no taste; the crystals crush between the teeth.

CITRATE OF IRON AND MANGANESE.

This salt is obtained in the same manner as the preceding, replacing the carbonate of manganese by carbonate of iron and manganese.

It is under the form of small white granular crystals, almost insoluble in water, and with scarcely any taste.

It might serve, as M. Bouchardat proposed for citrate of iron, as a substitute, in many preparations, for lactate of iron and manganese, of which it has not the styptic flavor.

LOZENGES OF CITRATE OF IRON AND MANGANESE.

Carbonate of iron and manganese . . .	1·0
Very fine sugar flavored according to fancy .	16·3
Make lozenges by dropping of	0.5

These lozenges, which are pleasant to take, may be of very great service in chlorosis and its modifications.

CITRATE OF MANGANESE AND SODA.

Citric acid . . .	100·0
Crystals of soda . .	40·0
Water . . .	500·0
Humid carbonate of manganese . .	q. s.

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Dissolve the acid in the water at about 122° F.; add the crystals of soda by degrees, and saturate the solution with the humid carbonate of manganese. Filter, evaporate at a gentle heat to a syrupy consistence; pour on sheets of glass and dry in a stove. The citrate is thus obtained in the form of white transparent scales.

This salt is very soluble in water; it is unalterable by the air: it has scarcely any taste.

CITRATE OF IRON, MANGANESE AND SODA.

Operate as above, by saturating the solution of citrate of soda with carbonate of iron and manganese.

The solution is of a brown green color; by evaporation and dessication in the stove, as in the preceding case, this salt is obtained under the form of scales of the color of dead leaves, very soluble in water. The taste is inky.

Tartrate of manganese and tartrate of iron and manganese may be obtained in the same manner.

SOLUTION OF IRON AND MANGANESE FOR DOCTOR GENSOUL'S FERRO-MANGANESIC WATER.

Citrate of soda, iron and manganese	30·0
Water	500·0

A dessert spoonful of this liquid in a quart of water to be taken with the meals, pure or mingled with wine.

LACTATE OF MANGANESE.

This salt is obtained by the same processes as lactate of iron. It is under the form of pinkish white plates.

Its solution, properly diluted with water, and heated for an hour on a sand bath in a closed alembic, and then allowed to cool very slowly, deposits the lactate in the form of rhomboidal prismatic crystals. This salt is more soluble in water than the lactate of iron; its taste is sweetish and inky.

LACTATE OF PROTOXIDE OF IRON AND MANGANESE.

This salt is obtained by decomposing lactate of lime by a mixture of three parts of sulphate of iron and one part of sulphate of manganese, and operating as for lactate of iron.

SYRUP OF LACTATE OF IRON AND MANGANESE.

Lactate of iron and manganese	4·0
Pounded sugar	16·0
Triturate together, and add of distilled water	200·0

Dissolve quickly; pour the liquor into a mattrass in the sand bath containing

Broken sugar	384·0

Dissolve and filter.

This syrup contains about fifteen centigrammes of lactate of iron and five centigrammes of lactate of manganese in thirty grammes: it replaces, with marked advantage, all other ferruginous syrups: its use is becoming general at Lyon and the whole of the south of France.

LOZENGES OF LACTATE OF IRON AND MANGANESE.

Lactate of iron and manganese	20·0
Fine sugar	400·0
Water	q. s.

Make drops of 0·5.

They are prescribed in doses of from six to twelve in the twenty-four hours, in chlorosis and its dependant inconveniences.

These lozenges should in all cases be preferred to the lozenges of lactate of iron of Gelis and Conté, which contain no manganese.

IODIDE OF MANGANESE.

Iodide of manganese is obtained in the form of small white crystals, very soluble in water, by exactly decomposing a solution of iodide of barium by sulphate of manganese, filtering, and quickly evaporating the liquor with heat out of contact with the air, and in the presence of quick lime.

The aqueous solution, exposed to the air, turns brown, and deposits at the end of a short time oxide of manganese.

IODIDE OF IRON AND MANGANESE.

Officinal Solution of Protiodide of Iron and of Manganese.

(According to the formula of Dr. Dupasquier.)

M. Hannon proposes preparing this product with iodine and *metallic manganese;* but it is very difficult to procure this last metal, of which the price is very high (55 to 60 francs for thirty grammes), we have thought it advisable to seek some more economical process; and we propose the following:—

	Grammes.
Tartaric acid	28
Distilled water	30

Dissolve.

Hydriodate of potassa	34
Distilled water	30

Dissolve and mix the two solutions. Leave the bitartrate of potassa produced to

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stand for twelve hours, filter and add a sufficient quantity of water to make 100 grammes of liquid, which are heated to about 95° F., then humid carbonate of manganese is added by degrees, until the addition of the carbonate causes no more effervescence in the liquid; it is filtered, and the filter washed with sufficient distilled water to make up 150 grammes of solution of iodide of manganese. By the addition of the carbonate of manganese there is a fresh precipitation of bi-tartrate of potassa, and likewise a little tartrate of manganese; but all the iodine remains in the state of iodide of manganese in the liquor, which only retains a slight orange color due to a portion of the iodine remaining free.

On the other hand, take

Iodine . . .	65·0
Very pure iron filings .	20·0
The above solution of iodide of manganese .	150·0

Put first the iodine, then the solution, and finally the iron, into a flask, raise the temperature to about 176° F., stirring occasionally until the decoloration is complete, and filter it into a cask containing twenty to thirty grammes of turnings or fine iron wire; wash the flask with fifty grammes of distilled water, and throw it on a filter, which is then washed again with sufficient water to obtain exactly 300 grammes of product.

Thirty grammes of the above water may, with advantage to the preservation of the product, be replaced by an equal quantity of gum and sugar dissolved in the water intended for washing the flask and the filter.

This solution contains one-third of its weight of protiodide of iron and manganese, which are themselves in the proportion of about three of iodide of iron to one of iodide of manganese.

For keeping it two phials are used, one holding about thirty or forty grammes, in which are placed some Paris points, kept constantly full, so as to preserve it from contact with the air, which is used in the business of the establishment, and the other of any size which contains the remainder of the iodide of iron and manganese, on iron filings or wire, as indicated by Dr. Dupasquier, and intended to fill the first phial as soon as any part of its contents are removed.

SYRUP OF PROTIODIDE OF IRON AND MANGANESE.

Officinal solution	6·0
White syrup	294·0

Mix. 30 grammes of syrup contain 0·2 of protiodide of iron and manganese.

An excellent preparation in the treatment of chlorosis, scrofulous swellings, tuberculous affections, etc.

It is prescribed in doses of 1 to 3 spoonfuls per day.

PILLS OF IODIDE OF IRON AND MANGANESE. (FORMULA OF M. BLANCARD'S PILLS.)

	Grammes.
Officinal solution	16·00
Honey.....	5·00
Absorbant powder.....	0·05

100 pills.—Mix the honey and the solution, evaporate rapidly at first, finally at a gentle heat, until the weight of the mixture is 10 grammes. Add a sufficient quantity of powder of mallow and liquorice, about 9·5. Divide the mass into four equal portions which are to be rolled in powder of iron reduced by hydrogen; elongate the little masses into cylinders on an iron plate, and divide each into 25 pills, which must be rolled in powdered iron to cover the parts exposed by the division. Then proceed to a second operation, which consists in covering the pills with a layer of balsam of Tolu, operating as directed by M. Blancard.

Each pill contains about 5 centigrammes of iodide of iron and manganese.

These pills are employed with advantage as a substitute for pills of simple iodide of iron and in the same manner. The *first week*, two are taken morning and evening; the *second week*, three morning and evening, and this dose is continued until the cure is complete. Children and weakly people should begin with a smaller dose: one pill morning and evening, and augment gradually in the proportion which we have pointed out.

We must add in conclusion that M. Petre quin generally prescribes preparations of iron and manganese in smaller doses than are usual for iron, and that he succeeds perfectly, because he does not administer one product at a time, but he combines several preparations (such as powder, chocolate, syrup, or pills, etc), and finally, because the addition of the manganese makes the ferruginous medication far more efficacious.

CRYSTALLOGRAPHIC NOTE ON THE SULPHATE OF PROTOXIDE OF MANGANESE.

M. Drian, to whose kindness we already owe the crystallographic study of lactate of manganese, has likewise determined the crystallographic formula of sulphate of manganese, on some magnificent crystals

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which we sent to him; but his labors being as yet incomplete, as showed in the following note, we shall make known the conclusion at some future period.

"The primitive form of sulphate of manganese is an unsymmetrical oblique prism; the crystals which I have examined have a strong resemblance to certain varieties of axinite. The lateral angles are modified by facettes, as well as two solid angles; but these crystals having no point of cleavage, and possessing, on the contrary, a perfectly conchoïdal fracture, I have not been able to decide what ought to be the position of the primitive prism from the samples which M. Burin du Buisson has sent me, because they have presented but one variety. I must therefore wait until some new crystalline forms appear, so as to enable me to judge." —*Répertoire de Pharmacie*, May, 1852.

REMARKS ON THE PREPARATION OF LEMONADE OF CITRATE OF MAGNESIA.

BY M. E. ROBIQUET.

M. ROGÉ, by first discovering the singular property possessed by citric acid of disguising the disagreeable taste of magnesia, rendered a great service to medicine, and his purgative lemonade constitutes one of the most valuable medicaments to which we have recourse in therapeuties. Citrate of magnesia acts as a purgative with nearly as much energy as the sulphate, but it has the inconvenience of not being able to be so well kept in solution, and of communicating to lemonade which has been prepared for some days a viscidity which renders it impossible to employ it. I have long sought the cause of the alterability, in the hope of finding the means of destroying it, if not entirely, at least partially, when once I found it out. Having remarked in the first place that the solutions of citrate of magnesia, when left to themselves for a certain time, became mouldy and deposited an amorphous white powder resembling lactate of lime in physical appearance, I thought that the citric acid used contained some traces of nitrogenous organic substances, which, by acting as a ferment, caused their destruction. It is not so however, for in this reaction a very small quantity of citric acid is destroyed, and almost the whole will be found either in the liquor or in the white deposit. Moreover, this white deposit is nothing but citrate of magnesia become amorphous and insoluble, but containing distinctly the same proportions of acid and of base as the crystallised citrate. There is then a molecular change, and there is no practitioner who has not witnessed it; for it frequently happens that on saturating with calcined or carbonated magnesia a rather concentrated solution of citric acid, the liquor suddenly becomes a mass and disengages an amount of heat which is appreciable to the thermometer. Citrate of magnesia produced under similar circumstances is nearly insoluble, and its taste is anything but agreeable. It sometimes happens that when the liquor is very dilute, the citrate is precipitated after a shorter or longer time, under the form of a jelly, the consistency of which necessarily depends upon the quantity of water used. It is a transformation of the same nature which renders purgative lemonade stringy when it has been prepared for several days. This curious molecular transformation is not without example in chemistry, and I have myself had occasion to notice it many times. Thus, when, in preparing chloride of strontium, we decompose the sulphuret of the same metal by hydrochloric acid, it is not uncommon to see the liquor become a gelatinous mass, which is transformed easily into well-defined crystals when redissolved by a sufficient quantity of boiling water and evaporated. A phenomenon of the same nature is almost always produced in the preparation of the silico-fluoride of potassium which is used to obtain silicium.

Being convinced that the facility with which the solutions of citrate of magnesia spoil depends on the intimate constitution of this salt, I thought that it would be impossible to prepare this lemonade so as to ensure its preservation for an indefinite time, and that I must think only of some process by means of which this purgative would decompose more slowly than it generally does.

For this purpose I have made an infinity of mixtures and trials, but I will excuse the reader their enumeration, and give only the formula which was the most successful. It is as follows:—

Perfectly white citric acid..	400 gram.
Carbonate of magnesia....	200 ,,
Spring water	5 kilog.
White sugar, No. 1	600 gram.
Tincture of orange or lemon peel	5 ,,

Dissolve the citric acid in the water, cold, saturate by the carbonate of magnesia, and when the combination is effected (which will require five or six hours), dissolve the sugar, likewise without heat. Add the tincture of peel, filter through paper: which is in tenths:—500 grammes for lemonade of 50 grammes, 450 grammes for lemonade of 45 grammes, etc.

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Add to each bottle: bicarbonate of soda, 5 grammes, cork, seal and apply the capsule very quickly.

These are the motives which have led me to employ this method.—In the first place, I make all my solutions cold, because citrate of magnesia remains longer soluble and unalterable when prepared at a low temperature. Moreover, I avoid using the common simple syrup, because, being clarified with white of egg, it always retains some albumen, which by its natural viscidness assists the tendency which the salt of magnesia has of becoming gelatinous. Finally, to render the lemonade effervescing, I use bicarbonate of soda, because citrate of soda crystallises more clearly than citrate of magnesia, and not having, as the latter salt has, the inconvenience of undergoing molecular changes, its presence prevents the metamorphosis.

I shall conclude with one remark: some practitioners sweeten their lemonade with sugar of gum for the purpose of softening and concealing the excess of acid; but this modification is more injurious than useful, for gum arabic acts on the magnesian salt in the same manner as albumen, and hastens its decomposition.

By following the method which I have just indicated, lemonade of 40 or 50 grammes may be kept ten or fifteen days without alteration, and those which contain 20 to 40 grammes of citrate of magnesia may be kept for nearly a month.—*Journal de Pharmacie.*

CHLOROFORM IN OPERATIONS.

To the Editor of The Lancet.

SIR,—As the value of a practical hint depends on the simplicity of its application, I may perhaps be excused for requesting your insertion of a communication which might, except on this ground, appear too trifling and deficient in interest to trouble you with.

I have been in the habit of using chloroform freely, but not indiscriminately, in operations; and have for a long time adopted the following precaution in its exhibition:—Assuming as a general principle that sensation and a conscious exercise of volition are simultaneously suspended, I direct my patient to make some voluntary effort, such as raising his hand, or squeezing that of an assistant—giving him to understand, that directly he ceases to do so at command, the operation will be commenced. The patient readily enters into this arrangement, and never fails of efficiently executing his part. If the operation be brief, it is unnecessary to continue or repeat the inhalation; but if protracted, this state of complete or almost entire insensibility to pain may easily be maintained by even an unpractised assistant.

The obvious advantage of this plan (which doubtless has been acted upon by others beside myself) is that of affording a sure and very simple criterion by which to judge of what is a sufficient dose of the anæsthetic. The effect is attained without risk, though I admit that patients are sometimes less docile than where the nervous system is more entirely under the influence of the free and prolonged exhibition of chloroform. I have never known it to produce sickness during its inhalation in this moderate quantity, and but rarely even nausea or headache afterwards—a point of no trifling importance, where the operation is serious.

The effect of chloroform on the system appears to be very analogous to, if not absolutely identical with, that of alcoholic drinks taken into the stomach, the intoxication being more transient when produced by the inhalation of the vapor. I believe that we may thus account for the occasional shrinking of patients, and their expressions of suffering under operations, when they afterwards declare that they have experienced no pain. They do feel, probably but slightly, yet forget all about it, as the drunken subject of a severe accident wonders where he is, and what has happened, when he finds himself, on recovering his consciousness, within the walls of an hospital. As an overdose of alcohol is not a desirable introduction to the treatment of a grave accident, so I think we should be specially cautious in the administration of chloroform when about to perform a serious operation. I do not regard the shock which the physical frame sustains from the infliction of pain as, *per se*, of very material importance; I do not mean to undervalue the boon on this account; but I more highly estimate the moral relief which the anticipation of undergoing a painless operation affords. Patients who have not felt the knife certainly complain more afterwards of the wound inflicted. Probably this is explained by the relative intensity of the suffering, as experienced during and after an operation, by those who have not had chloroform.

Mr. Carpenter, house-surgeon to St. Thomas's Hospital, who has been in the habit of superintending the administration of chloroform in our operating theatre, informs me that the indications afforded by the pulse, respiration, and state of the pupil, entirely coincide with the simpler test which

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I have referred to. Mr. Carpenter adds that he considers there is no risk, so long as the pulse and respiration retain their natural relation to each other in point of frequency, even though both be accelerated; but he regards an increasing rapidity of pulse, accompanied by diminished frequency of respiration, as an unequivocal indication that the administration of the chloroform should be immediately suspended.

An instrument such as that manufactured by Mr. Bigg, is simple and efficient. It is provided with two India--rubber discs, which act as valves in an opposite direction. The inspired air is thus freely admitted over the moistened sponge by one aperture, and the expired air is expelled by the other.

From one to two drachms I have usually found sufficient to effect the required purpose; but this, it is well known, varies extremely in different individuals. In one case under my care, complete insensibility was produced almost instantaneously. The patient was partially under the influence of a very moderate opiate, which perhaps rendered him more susceptible of the agency of the chloroform. If this be so, might not the combination be desirable under some circumstances?

I am, Sir,
Your obedient servant,
F. Le Gros Clark.

Spring-gardens,
May, 1852.

ON THE GALBANUM PLANT.

BY F. A. BUHSE.

The author states, that in his travels in Persia he discovered the plant which yields galbanum. In June, 1848, he found it on the declivities of the Demawend. It is a ferrula, from the stalks of which a liquid issues abundantly, by the odor and nature of which he immediately recognised galbanum, and his guides assured him, moreover, that galbanum is gathered from this plant. The author has not yet distinctly determined the plant. It appears to differ from *Ferula erubescens* (*Annales des Sciences*, iii., Sér. 1844, p. 316) only by the absence of commissural vitæ; but as neither Aucher-Eloy nor Kotschy, who have both collected the Ferula erubescens, make any mention of its yielding galbanum, the author is in doubt whether his plant be the same, or a variety of it. Don's genus Galbanum (Trib. Sibrinæ) and Lindley's Opaïdia (Trib. Smyrneæ) do not agree with the plant seen by Buhse, unless that both of these authors have made their descriptions from imperfect fruits, or that there exist other plants which yield galbanum. The plant which Buhse describes is called, in some parts of Persia, *Khassuch* (not *Kasneh*, which means Cichor intybus, nor Gäshnis, which is Coriand. sativum), and appears to be confined to certain districts of Persia. In the whole large district of the Elburs-chain, from the south-east angle to the south-west angle of the Caspian Sea, it is only found in the neighbourhood of the Demawend; but here at an elevation of from 4000 to 8000 feet, and even on the declivity of the top of the Demawend. It exists neither on the mountains of Talysch, nor in the districts of Karadagh and Tabris. It is said to re-appear on the Mount Alwend, near Hamadan, and in the neighbourhood of the great salt-desert. Near Hamadan Aucher-Eloy has gathered his Ferula erubescene, and this supports the supposition that the author's plant is the same. In the salt-desert itself Buhse did not meet with it again. The inhabitants of the Demawend collect the gum-resin, which issues spontaneously from the lower part of the stalk; they do not make incisions in the plant; but it is not at this place that the galbanum is collected for commercial purposes. When fresh, the gum-resin is white like milk, liquid, and somewhat glutinous. In the air, it soon becomes yellow, elastic, and finally solid. The odor is rather strong, unpleasant, and similar to that of our commercial galbanum.—*Central Blatt*, für 1852, No. xiii., and *Pharmaceutical Journal*.

PASTE OF PUMPKIN SEEDS IN TÆNIA.

More than thirty years ago, Dr. Mongeney called the attention of physicians to the paste of pumpkin as having uniformly succeeded in expelling tænia in 7 or 8 hours. He mentioned, among others, cases in which all previously-known remedies had failed, and in which the success of this medicament was complete: the paste which he ordered was composed of 90 grammes of fresh pumpkin and 180 grammes of honey. Since then, many physicians have obtained good results from the same means. Dr. Brunet, of Bordeaux, among others, has employed it with success more than thirty times; Dr. Sarramea has likewise succeeded in expelling tænia a great many times by the same process; these physicians employed a paste composed of 45 grammes of the seeds of the large pumpkin (*cucurbita maxima*) combined with 45 grammes of sugar. In another case, a physician attacked with a worm which gave him great inconvenience

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took over-night 30 grammes of pumpkin seeds, pounded with 10 grammes of sugar, and which, having used a simple lavement twelve hours after, caused him to pass 7 metres of tænia. Such facts are of a nature to encourage practitioners to prescribe in all cases of tænia, a medicine which, even if it were not quite so certain in its action as pomegranate root, oil of fern and kousso, should always be tried in the first place on account of its cheapness and certain innocuity.—*Journal de Medicine de Bordeaux.*

ON GAMBIR.

BY BERTHOLD SEEMANN.

BLACK pepper (*Piper nigrum*, Linn.) and Gambir (*Uncaria Gambir*, Roxb.) are grown in great quantities (in Singapore), and exclusively by the Chinese, for both these articles are so exceedingly cheap that Europeans have not deemed it worth their while to engage in the speculation. Pepper and gambir plantations are always combined, because the refuse of the gambir-leaves serve as an excellent manure for the pepper; and moreover, what is of equal, if not of still greater importance, kills the lalang (*Andropogon caricosus*, Linn.), a plant which, like the couch-grass (*Triticum repens*, Linn.), spreads with astonishing rapidity over the fields, growing so close together and so high, that within a short space of time valuable plantations are rendered useless, and many have to be given up from the utter impossibility of freeing the ground from this weed.

The process by which gambir is extracted and prepared is simple. The leaves are boiled in water until all their astingent property is extracted. The decoction is then poured into another vessel, in which it becomes inspissated, and, when nearly dry, is cut in small square pieces, and thus brought into the market. M'Cullock states that sago is used in thickening it. This, however, at least in Singapore, is not the case; but, instead of sago, a piece of wood is dipped into the vessel, by which the desired effect is produced. It must, indeed, be an extraordinary substance, the mere dipping of which into the fluid can cause it to become a thickened mass. I was very eager to obtain a piece of this wood: unluckily, the Chinaman, whose laboratory I visited, could not be persuaded to part with his, and a friend of mine, who was exerting himself to procure a sample, had not succeeded at the time of the Herald's departure: he promised, however, to send it to England, accompanied by the Malayan name, and specimens of the tree.—*Hooker's Journal of Botany.*

ON THE PREPARATION OF STRAMONIUM OINTMENT.

BY EUGENE DUPUY, PHARMACEUTIST, NEW YORK CITY.

THE powerful narcotic and sedative properties of the Datura stramonium, added to the fact of its luxuriant growth in the vacant grounds of the inhabited districts of the United States, has made its use popular with most of our practising physicians. Besides its use smoked as tobacco in asthmatic cases, its properties, analogous to those of hyoscíamus and belladonna, have enabled practitioners to use with success for producing dilatation of the pupil and in anodyne fomentations. In fact, the consequence of its demonstrated efficient activity as a remedial agent, has prompted its adoption in the United States Pharmacopœia, where the leaves and seeds are recognised, and the tincture, extract, and ointment are officinal. According to our Pharmacopœia, last edition, to prepare the ointment, one drachm of the extract of stramonium is mixed to the proportion of one ounce of lard. Such a mixture, though possibly as effectual as need be, lacks the green color and homogeneity to which both patients and physicians have been accustomed. To remedy these objections, I have found the following process to give a good preparation both in quality and appearance. I am inclined to think that the objections which have been made to the former officinal ointment are chiefly ascribable to the difficulty of obtaining readily an ointment which would keep one year, that is free from water of vegetation or not impaired by a too protracted ebullition, and consequent decomposition, which deprives it of its properties, spoiling its appearance, and giving it an unpleasant pyrogenous odor, which shows the extent of the alteration it has undergone, making of it an irritating rather than a soothing unguent. In the process I now submit to the opinion of the profession, I had in view, 1st. To obtain at all seasons an ointment fulfilling the reasonable expectations of practitioners; 2nd. Which could be easily prepared by competent pharmaceutists throughout the United States. It is as follows:—

Stramonium leaves..half a pound.
Alcohol at 95°.....a sufficient quantity.
Prepared lard.....fourteen ounces.

Moisten the leaves, previously reduced to a coarse powder, with sufficient alcohol, in a tight vessel having a suitable cover; melt the lard in a pan three times in capacity to the bulk of the lard, and stir in it gradually

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the prepared stramonium; keep the mixture in a warm place for five hours, stirring occasionally, till the alcohol has disappeared from the ointment, which may be ascertained by placing a lighted match on the surface of the warm ointment just stirred. Filter the mixture through flannel, in an appropriate vessel. The stramonium ointment thus prepared is a reliable preparation, possessed of a handsome green color, a rather pleasant herbaceous odor, and forms a homogeneous mass containing all the valuable constituents of the Datura stramonium, if the leaves have been gathered while the plant is in bud, and properly preserved. For the warm days of summer the substitution of two ounces of beeswax for the same quantity of lard gives it the consistence which it has at the low temperature of the remaining seasons.—*New York Journal of Pharmacy*, January, 1852.

COMPOUND FLUID EXTRACT OF SENNA AND DANDELION.

BY EUGENE DUPUY, PHARMACEUTIST, NEW YORK CITY.

Senna (officinal) . .	2 pounds.
Torrefied dandelion root .	1 pound.
Chamomile . . .	¼ of a pound.
Sugar	20 ounces.
Carbonate of potassa or soda	1 ounce.
Oil of Gaultheria . .	½ a drachm.
Alcohol	2 ounces.
Water	½ a gallon.

Mix the dry plants, previously reduced to a coarse powder, with the water holding the alkaline carbonate in solution: let the mixture stand twelve hours; introduce it in a percolator, and gradually pour in water until a gallon of liquid shall have passed; evaporate it to twenty ounces by means of a water bath, then add the sugar, filter, and make the addition of the alcoholic solution of gaultheria when cold. By following this process, I believe that a kind of saponification takes place, which allows of the more ready solution of the active principle of the senna in the aqueous vehicle, probably because chlorophylle being united to a dried essential oil, participating in the properties of resins, is rendered soluble, and the extractive portion being denuded of its resinoid covering, is more readily extracted by the percolating liquid. I make use of a percolator possessed of a convenient hydraulic power, it has rendered readily, within thirty hours, a highly saturated liquid, containing in a gallon all the soluble principles of this extract. Ordinary percolators will answer also; but the ingredients needing to be more loosely packed, do not yield so fully or so readily. The addition of torrefied dandelion root is intended to give to this fluid extract some greater value on account of its peculiar action on the hepatic system. I employ in preference the German chamomile (Camomila vulgaris*), because of its pleasant aroma and its carminative properties, joined to a bitter principle, which seems to increase the purgative effect of the senna.

This extract has become a favorite antibilious purgative with many of our practitioners, who, some of them at least, have used it with success with children, who can take it readily, as well as for adults, where an antibilious purgative is desirable, seldom producing pain or nausea, and not liable to induce constipation.—*New York Journal of Pharmacy*, January, 1852.

ON THE PROTECTION AGAINST SMALL-POX AFFORDED BY VACCINATION, ILLUSTRATED BY THE RETURNS OF THE ARMY, NAVY, AND THE ROYAL MILITARY ASYLUM.

BY T. GRAHAM BALFOUR, M.D., SURGEON TO THE ROYAL MILITARY ASYLUM.

One of the principal difficulties in the investigation of this subject, the author thought, arose from the impossibility of ascertaining what proportion of the general population was unprotected by vaccination. Accurate deductions could, however, be founded on the returns of the army, navy, and Royal Military Asylum. Although the returns of the first department did not show the actual number of soldiers who had been vaccinated or had the small-pox, yet a tolerably accurate approximation might be obtained. From returns forwarded to the Army Medical Board, it appeared that out of 90,092 recruits medically inspected and found fit for service, 20,132 bore marks of small-pox, 64,096 had marks of vaccination, and 5,864 bore no distinct traces of either. By the rules of the service, the latter would be immediately vaccinated; added to the second class, a total of 69,960, or 78 per cent. of the whole, would be protected by vaccination; 22 per cent. representing the proportion of those protected by previous small-pox. The question next arising was, what number of admissions into hospitals and deaths by small-pox had occurred in this number. Abstract No. 1 in the Appendix furnished this information, and it showed the proportion of cases of small-pox to have been 66, and the deaths 8, in every 100,000

* Matricaria.

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men serving throughout the army. But the prevalence and mortality varied in different portions of the force. Thus, the deaths had been four times as numerous among the troops in the United Kingdom as in temperate colonies, and eight times as numerous as in tropical colonies; while a still greater disproportion was found to exist in the admissions into hospital. A comparative statement of the proportion of small-pox among the black troops and Europeans serving in tropical colonies during several epidemics was furnished, by which it appeared that the disease literally decimated the black troops, while not a single death occurred among the European soldiers serving in the same garrisons. The author observed, that if the hypothesis be correct, that the protective power of vaccination became gradually weaker, and at length died out, the mortality from small-pox should be greatest among the old soldiers. The following return illustrated this point:—

Ages.	Aggregate strength at each age.	Died by Small-Pox.	Ratio of Deaths per 1000 of strength
Under 20	43,833	15	0·342
20 — 25	90,041	28	0·311
25 — 30	49,285	3	0·061
30 — 35	37,151	8	0·216
35 — 40	25,017	1	0·040
40 & upwards.	9,270	0	....
Not known.	....	1	....
	254,957	56	220·0

Returns from the navy exhibited the same satisfactory evidence of the protective power of vaccination. The vaccination register of the Royal Military Asylum had been kept with great care, and reliable evidence could be obtained from it. During a period of 48 years, 31,705 represented the aggregate strength of the boys, and among these only 39 cases of small-pox occurred, of whom 1 died. It must be borne in mind that every child bore marks of cow-pox or small-pox or had been subsequently vaccinated so that, in a population completely protected, the average was but 123 cases, and the deaths but 12, in every 100,000, being a still lower ratio than in the army serving in the United Kingdom. Another return displayed the comparative amount of protection afforded by vaccination and previous small-pox. The ratio of cases per 1000 of the latter was 6·15, and the deaths 2·05 while of those previously vaccinated, the ratio of cases was 7·06, and the deaths 0. All the deaths were thus from secondary small-pox. The author thought the preceding facts afforded the most conclusive evidence of the protective value of vaccination, while the extensive numbers, and the period of time over which the observations extended, justified a very firm reliance on such evidence. He thought this evidence had an important bearing on the proposition recently made to legalize inoculation. While so large a proportion of the community remained unprotected by vaccination, he thought such a course most unjustifiable. Absolute immunity from small-pox was not to be expected, but the foregoing returns showed the great exemption obtained by vaccination. Vaccination should be made compulsory. It had been said that this would interfere too much with the liberty of the subject; but so to a certain extent did all measures relating to the public health. The prejudices of the few must be made to give way before the interests and safety of the many. In Factory Acts, parliament recognised the principle of protecting the young against an amount of labour calculated to be injurious, and this in spite, not of the prejudices, but of the so-called rights of parents; and it would be but an extension of this humane principle to make vaccination compulsory, and thus afford protection against a malady of so fatal a character as small-pox.

ON THE DIMINUTION OF THE CHLORIDES IN THE URINE, OR THEIR ABSENCE FROM THAT FLUID, IN CASES OF PNEUMONIA; AND ON THE CHEMICAL COMPOSITION OF THE SPUTA IN THAT DISEASE.

BY LIONEL SMITH BEALE, M.B. Lond.

THE author's attention had been first drawn to this subject by some observations of Dr. Redtenbacher, who had noticed the absence of chloride of sodium from the urine in pneumonia, and who, in 1850, had pub-

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lished the fact that the chloride gradually diminished until the period of hepatization had occurred, when it disappeared altogether from the urine, and gradually reappeared as resolution progressed. A diminution of the quantity of chloride in a variety of diseases of the inflammatory type, had been noticed by Franz Simon; but in these diseases they appeared only to suffer diminution, and not to be invariably absent from this fluid, at the period of inflammatory condensation, as Dr. Redtenbacher had shown to be the condition in pneumonia. The author, with a view, if possible, of making out the channel through which the chloride of sodium was eliminated from the system in this disease, or of determining the locality in which it was stored up, and desirous also to trace the connexion between the absence of the salt from the urine and the occurrence of hepatization, had instituted the observations which formed the subject of the paper. The observations were made on cases in King's College Hospital, and were taken indiscriminately from amongst the mild and severe. The mode adopted by Dr. Redtenbacher, to estimate the quantity of chloride present, appeared to be simply approximative. The author desired to obtain quantitative results, and pursued a closer and more accurate method of analysis. He showed that if the chloride was estimated merely by nitrate of silver and nitric acid, volatile chlorides would be thrown down, as well as the fixed chloride of sodium, and he had not overlooked the fact of the presence of hydro-chlorate of ammonia as one of the ordinary constituents of urine. By the rude method just mentioned, chloride of sodium might be entirely absent from the urine, and yet an abundant precipitate be furnished by nitrate of silver, insoluble in nitric acid. The following was the method pursued:—The reaction and specific gravity were first observed; 1000 grains were then evaporated to dryness over a water-bath, and subsequently at 200° in a water-oven, and the dry residue weighed for the amount of water. A weighed portion of the solid residue was incinerated, and carefully decarbonized at a dull red-heat; and the weighed residue, by calculation, gave the amount of salts present in 1000 parts. The soluble portion of this saline residue was taken up by distilled water, acidulated with nitric acid; nitrate of silver being then added, the presence of fixed chloride was at once detected. The precipitate, if any, was washed, dried, ignited in a porcelain crucible, and weighed, and the chloride of sodium calculated from the chloride of silver obtained. This method gave in each analysis the quantities of water, solid matter, fixed salts, anchloride of sodium, in 1000 grains of urine. A similar method was pursued in estimating the amount of chloride existing in the sputa, blood, and urine. The necessity for correct diagnosis, and the selection of well-marked cases of the particular morbid condition under consideration, was of the utmost importance in all chemico-pathological investigations. The notes of the cases which formed the subject of these analysis were kept by the clinical clerks of the physician under whose care the patient had been placed. The variable quantities of chloride of sodium, its deficiency or absence, was not peculiar to pneumonia, but might sometimes depend upon the proportion taken in with the food. It might, however, be considered that healthy urine contained 3·5 per 1000 or five per cent. of the solid matter. The absence of chloride of sodium from the urine indicated generally a deficiency, or at least no excess, of that salt in the blood; but the interesting fact in regard to pneumonia was, the total absence of this salt from the urine at a particular phase of the disease, and its excess in other secretions, or in the inflammatory product itself; and this fact might be viewed as one of a series of phenomena, which, when more fully investigated, was calculated to shed some light on the hidden processes of pathological metamorphoses. Then followed a full record of nine cases of pneumonia, with the analysis of the urine. The sputa were analysed in the third, seventh, and eighth cases. The hepatised portion of the lung in one fatal case was also analysed, and the results compared with equal weights of healthy lung. The deductions which the author sought to establish were—1. That in pneumonia there is a total absence of chloride of sodium from the urine, at or about the period of pulmonary hepatization. 2. That as resolution of the inflammation proceeds, the chloride becomes restored to the urine. 3. That at this period the serum of the blood is found to contain a greater proportion of chloride than in health. 4. That the presence of chloride of sodium in the urine indicates an excess of that salt in the blood; and that its absence from the urine implies that the blood contains less than the average quantity. 5. That the sputa of pneumonia contain a greater quantity of fixed chloride than healthy pulmonary mucus. 6. That there was reason to believe that the absence of this salt from the urine in the stage of hepatization depended on a determination of the salt to the inflamed lung; and that when resolution occurred, it

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was re-absorbed, and appeared in the urine. —*Royal Medico Chirurgical Society*, June 8, 1852.

SAL AMMONIAC IN FEVER.

BY M. PADIOLEAU.

M. PADIOLEAU, of Nantes, informs the Academy that he has obtained excellent results from the following preparation, which is nothing but an old opiate, in the treatment of intermittent fevers:—

Sal ammoniac	12	grammes.
Salt of absinthium	12	,,
Salt of tamarinds.....	12	,,
Carduus benedictus	12	,,
Quinquina in powder	64	,,
Syrup of absinthium	q. s.	

Divide into 12 equal portions.—*Journal de Chimie Medicale*, April, 1852.

ON SULPHUR AND ANISE.

BY M. E. ROBIQUET.

IT is well known that to prepare balsam of sulphur and anise it is sufficient to heat on a sand-bath, 1 part of flowers of sulphur with 4 parts of essence of aniseed until the mixture has become of a deep red color. It is then suffered to cool, and the liquid is not decanted until it is perfectly limpid. If the progress of this operation be carefully followed it is not difficult to see that the essence dissolves an appreciable quantity of the sulphur only when it has passed into the state of soft sulphur; a molecular change which is proved by the brown color acquired by the mixture. Now we know that sulphur begins to undergo this transformation at about 372° F., but as, on the other hand, this is the boiling point of essence of aniseed, we are obliged, so as not to lose too much essence, to operate at about 302° F. Notwithstanding this precaution, there always evaporated a very large proportion, and besides the reaction requires a long time to accomplish. For the purpose of obviating these inconveniences I propose to operate in the following manner:

℞ Flowers of sulphur ..... 1 part.
Essence of aniseed ..... 4 parts.

Place the sulphur in an assayer's matrass and subject it to a temperature of about 372° F., until, having liquified it has again become solid. Then plunge the matrass in cold water, pour in the essence and cork the apparatus slightly, keep it for half an hour at the boiling point of water. After reposing for a day, the balsam of sulphur will be perfectly limpid and may be readily decanted.

Thus prepared, this medicament contains 8·33 per cent. of sulphur, which is easily ascertained by a simple evaporation to dryness. That prepared by the old process contains but 7 per cent.

By adopting the slight modification which I propose, a product would be obtained which would contain a larger proportion of sulphur; moreover not a drop of essence of aniseed would be lost, and the operation would take but a very short time.—*Journal de Pharmacie et de Chimie*, Mar. 1852.

TREATMENT OF PRURITUS OF THE GENITAL ORGANS BY NITRATE OF SILVER.

NOTWITHSTANDING the great success which has been attained by the topical use of deutochloride of mercury and chloroform in the treatment of pruritus of the genital organs, there are nevertheless cases which resist these medicaments as well as many others which are in general use; we therefore think it useful to call the attention of practioners to the good effects which Dr. Winternitz has found in this affection from the topical use of nitrate of silver. In the case of a single woman aged twenty-five who suffered from intolerable itching of the vulva, he obtained a permanent cure in fifteen days, by prescribing fomentations three times a day, with a solution of three grains of salt of silver in an ounce of water. The same treatment was equally successful in the case of a man of fifty-five years, affected with *psoriasis diffusa*.—*Zeitschrift der k. k. Ges. d. œrzte zu Wien.*

FORMULA FOR THE CURE OF CHILBLAINS.

M. MARGOTON has lately submitted to the approbation of the Academy the following formula for the cure of chilblains.

Water	192	gram.
Concentrated sulphuric acid	3	,,
Tincture of saffron.....	15	drops.

Mix and soak in it a double compress, to be applied to the diseased part; renew every four hours, as recommended by Dr. Gibert. This remedy may, like other astringent and repercussive topical applications, be of some use in the treatment of chilblains, but it does not merit the pompous title of powerful specific given to it by its author.

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NOTE ON THE DIVISION OF GUM RESINS IN POTIONS, AND IN DIACHYLON PLAISTER.

AT a recent meeting of the Society of Pharmacy, M. Poulenc submitted a method which he has employed for eight years in his laboratory, for suspending gum resins in medical prescriptions. It is well known how much difficulty there is in suspending either in a mixture or lotion, one or more grammes of gum ammoniac, assafœtida, myrrh, &c. In dividing the assafœtida with yolk of egg alone, the manipulation is long; but if instead of the egg, we employ 6 or 8 drops of oil of sweet almonds per gramme, the gum resin, even when entire, is easily reduced; when the oil is well mixed, and the paste as homogeneous as possible, a little water is then added, then gradually the quantity of the prescribed vehicle, as for the mucilage of a linctus; the product of this operation will be a speedy and very perfect emulsion. One of the advantages of this *modus faciendi* is, that the product can be warmed without danger of coagulation, besides which, it is generally more easy to obtain a few drops of oil of sweet almonds, or any other kind of oil, than the yolk of an egg.

M. Poulenc has recently applied the same method to the manufacture of diachylon plaister, in the following manner: take some entire pieces of gum resin, and triturate them briskly in an iron mortar, after which in a marble, or porcelain mortar, mix in the oil, and add a sufficient quantity of water to obtain an emulsion about as thick as liquid honey; strain this through a coarse cloth; there will be hardly anything left on the cloth, and the strained substance will be perfectly homogeneous. Evaporate in an earthen vessel, by the water-bath, the water which had been mixed in, and when the mass presents the appearance of a soft extract, the other ingredients of the plaister may be mixed in with the greatest ease. This plaister presents a very beautiful appearance, and exhales a very decided odor of the gum resins employed in its composition. Should it be feared that the small quantity of oil might weaken the consistence of the plaister, M. Poulenc thinks that the quantity of turpentine might, without inconvenience, be slightly diminished.

We have tried with success the method of M. Poulenc for emulsions with gum resins; as to its further use in the preparation of diachylon plaister, we cannot speak with certainty.—There is a chemical question, which, in all cases governs the preparation of pharmaceutical agents.—*L'Abeille Medicale.*

POMMADE OF CHLOROFORM AND CYANIDE OF POTASSIUM.

BY M. CAZENAVE.

M. CAZENAVE, who has experimented comparatively with cyanide of potassium alone and united with chloroform, has found an immense advantage in combining these two medicines. The following are the formulæ which he employs:—

Pure chloroform ..... 12 grammes.
Cyanide of potassium .. 10 ,,
Fresh lard ..... 60 ,,
Wax, sufficient to obtain the consistance of a pommade.

A MODEST AND LIBERAL ADVERTISEMENT.

IN the advertisement-sheet of the *Pharmaceutical Journal* for last month, appeared the following specimen of justice and liberality:—

"JUNIOR ASSISTANT."

"Wanted by an old-established chemist and druggist, in a provincial county-town, (where a large dispensing trade is carried on), a YOUNG MAN, who has been a few years at the business. Respectable references will be required, and no salary given for the first six months. Apply," &c.

We should very much like to know what right this "old-established chemist and druggist" has to expect that any "young man" should give six months of his life and subject himself to the drudgery of a junior assistant's situation, with no recompense beyond his lodging and meals, the latter we can imagine on no liberal scale, without pay. In our opinion, this condition is abominably unjust, and we hope that no "young man" will be found to accept the miserly terms. Assistants are not generally too well paid; but if such a practice as this should become common, it would be better for young men had they been brought upas footmen, who always have the best of food, good clothing, and, generally excellent pay.

Of course we acquit the highly-respectable gentleman to whom application is directed of all responsibility for the advertisement in question.

NOTICE.— *All Communications, Books for Review and Substance for Notice must be addressed* "To the Editors of THE CHEMIST, care of Messrs. Piper Brothers & Co., 23, Paternoster Row, London." *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following No. will in future be received as late as the 20th.*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

REPORT ON THE WATER SUPPLY OF THE TOWN OF PRESTON.

BY PROFESSOR CRACE CALVERT.

To The Local Board of Health, Preston:

GENTLEMEN,—After several months of most careful and minute analysis, I have the honor to lay before you a report containing the results I have arrived at.

ANALYSIS

	Cowley Brook.	Loud scales.	North side of Longridge Hill.	Dutton Brook.	Service Reservoir.
Lime	0.473	4.446	1.534	0.952	3.251
Magnesia	0.186	0.561	0.195	0.286	0.730
Per oxide of iron	0.150	0.200	0.053	0.257	0.104
Sodium	0.627	0.554	0.419	0.530	0.595
Potassium	0.048	0.076	0.048	0.096	0.418
Sulphuric acid	0.300	0.798	0.601	0.587	2.055
Chlorine	0.721	0.642	0.556	0.706	1.222
Silica	0.850	0.400	0.426	0.481	1.200
Combined carbonic acid	0.514	3.942	1.190	0.913	1.648
Free carbonic acid	a trace	5.556	1.274	v.sm. quan	3.300
Nitric acid	none	none	none	none	0.329
Phosphates	.....	.....	.....	.....	0.200
Alumina	a trace	traces	.....	none	

From the above results the following saline compounds are supposed to exist in the waters:—

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	Cowley Brook.	Loud-scales.	North side of Longridge Hill.	Dutton Brook	Service Reser-voir.
Sulphate of lime	0.210	0.385	0.374	0.126	3.520
Carbonate of lime	0.690	7.352	2.350	1.610	2.203
Chloride of calcium	none	0.380	0.128	none	0.501
Sulphate of magnesia	.....	.....	0.215	0.472	none
Carbonate of do.	0.285	1.158	0.249	0.260	1.209
Chloride of magnesium	0.109	none	none	none	none
Sulphate of soda	none	0.887	0.339	0.205	.....
Silicate of do.	0.417	none	none	none	.....
Chloride of sodium	1.125	0.660	0.781	1.163	1.500
Sulphate of potassa	0.344	0.159	0.105	0.190	none
Silicate of do.	0.112	none	none	none	1.000
Carbonate of protoxide of iron	0.176	0.290	0.075	0.182	0.150
Creanate of do.....	none	none	none	0.743	none
Silica	0.510	0.400	0.426	0.481	0.170
Crenic acid	none	.....	.....	.....	.....
Silicate of lime	.....	.....	.....	.....	0.302
Nitrate of do.	.....	.....	.....	.....	0.500
Silicate of magnesia	.....	.....	.....	.....	0.500
Phosphates and alumina	.....	.....	.....	.....	0.200
	3.987	11.761	5.042	5.432 Crenic acid sub. 634	11.755
Total fixed residue per gal. obtained by evaporation	4.200	11.200	4.900	4.798 4.970	12.012
Organic matter per gallon	1.400	1.400	1.400	0.941	4.550
Free carbonic acid in grains ..	trace	5.556	1.274	small qr.	3.300

From the above analysis, the following observations have been made and results obtained:—

The water taken from *Cowley brook*, near the bridge, is the *purest* of the five that I have analysed: it has a beautiful appearance and an agreeable taste. It is one of the purest spring waters that has ever been analysed either in England or abroad, for (as you may observe) it contains only four grains of fixed saline matter per gallon. You will be more able to appreciate its high degree of purity when you are informed that chemists consider a water which contains from seven to nine grains per gallon of saline matter to be very good for domestic purposes. The water of the Thames contains twenty-one grains per gallon of fixed saline matter, and, that of the Seine 9.6 grains per gallon.

The water next in degree of purity is that obtained from the first duct of the present Company's conduit, on the north side of Longridge Hill, as it contains only about 4.9 grains of saline matter per gallon. This water has also a very beautiful appearance and pleasant taste. What recommends these waters principally to your notice is, that there do not appear the slightest grounds for doubting that their present degree of purity and softness will continue, as the different tributaries which compose the stream from which the samples for analysis were taken, have their source from deep springs, and not from surface drainage or shallow sand springs. Another fact, which bears out this point of view is, that their degree of purity proves that they must filter rapidly through the sandstone, millstone grit formations, of which the hills in which they exist are chiefly composed. Lastly, the poor state of the land on those hills is such that agriculture will never be able to turn them to account, and pollute their present purity by cattle, manure, &c.

The water third in degree of purity is that taken from Dutton Brook near the bridge.

This one contains only 4.97 grains of saline matter per gallon, but an objection to it is its peculiar turbid appearance, produced by the presence of a large amount of salts of iron. I have found, by personal inspection, that this objection may be, in a great measure, removed by suppressing the supply of water from three or four small springs, having their origin in formations containing per oxide of iron, which flow into the main stream, highly charging it with carbonate of iron, and creanate of oxide of iron. To substantiate this opinion, the following analyses were made:—

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	Per Gallon.
Right-hand branch of Dutton Brook above iron bed contains	0.40
Dutton Brook above iron-bed (quarry branch)	0.25
Dutton Brook lower portion below Bobbin Mill	0.21

Effectively they show that the amount of salts of iron varies in the different tributaries of Dutton Brook; and that, in fact, in some of them the carbonate, but principally the creanate of iron, exists in but very small proportion. Therefore by taking the purest springs, and leaving out those containing the salts of iron, I believe that a fair supply of water could be obtained; and even if this water is compared with that actually supplied to Preston, we shall find the advantage is in favor of Dutton Brook.

Service Reservoir, total residue	12.01
Dutton Brook do.	5.00
Service Reservoir, quantities of iron per gallon	0.15
Dutton Brook ditto	0.21

To convince myself that the iron of Dutton was due to only some of its tributaries, I examined samples of water from 9 springs, and the following results were obtained:

750 grains concentrated to 430 grains.

Tributaries.	*Appearance.*	*Order of intensity of tint, with yellow prussiate of Potash.*	*Intensity of tint.*
A.....	Turbid. Right bank.....	3.....	Slight blue
B.....	Clear appearance. Small supply ..	0.....	Trace.
C.....	Ditto	0.....	No iron.
D.....	Ditto	6.....	Very slight blue.
E.....	Turbid	4.....	Slight blue
F.....	Ditto	5.....	Very slight
G.....	Ditto	2.....	Rather dark
H.....	Clear appearance	7.....	Very, very slight.
I.....	Turbid. Upper supply	1.....	Dark blue.

It is clearly shown by the above table that the iron in this water is derived from A, E, F, G, I.

The temperatures of the waters from the north side of Longridge Hill, Cowley and Dutton Brooks, are the same as that of the atmosphere, excepting one of the Cowley Brook tributaries, which indicates 47 deg. Fah., while the atmosphere is at 40 deg. Fah.

The fourth water I have examined is that from Loudscale, taken from a field very near the spot from which the present Company intend obtaining their supply. This water often presents a very turbid appearance, but the principal objection to the employ of it is, the large proportion of saline matter it contains (in comparision to the other three previous waters), for it amounts to 11.2 grains per gallon, or nearly 2½ times as much as the one from Cowley Brook, or that from the north side of Longridge Hill, but the unfitness of this water for supplying Preston, compared with those two waters, will be fully understood by referring to the paragraph relating to their application in manufacturing purposes, and their degrees of hardness.

The water taken from the service reservoir of the present Company has also a turbid appearance, and is an impure water when compared with those from Cowley Brook or on the north side of Longridge Hill; for it contains 12.0 grains per gallon of fixed saline matter, and also a large proportion of organic matter, amounting to 4.55 grains per gallon. These results may at first sight appear extraordinary, as the only recognised spring which furnishes this reservoir, supplies the above pure water, and is on the north side of Longridge Hill; but an examination of the facts readily gives the solution of this apparent contradiction, as the quantity of water which passes through the present Company's conduit at the first duct, when compared to that which feeds the service reservoir, is comparatively small; therefore it must derive its principal supply from other sources. This is really the case not only from nearly all the surface drainage which takes place for the distance of 5½ miles which intervene between the first duct of the conduit on the north side of Longridge Hill and the reservoir, and which must find its way into the Company's conduit, owing to its bad and deteriorated condition; but also from the direct drainage from roads, dunghills, and ponds, where cattle after drinking often leave their fœces. This fact can be easily verified in the village of Longridge, and the following results place this point beyond doubt.

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Names.	FILTERED WATER PER GALLON. Organic matter.	Mineral matter.
B—Roadside, bottom of village	2.8	8.40
A—Conduit at Longridge, back of Wheat Sheaf	3.15	10.15
E—From open conduit, immediately before entering Grimsargh reservoir	3.15	9.80
C—Double conduit at Topping's farm	2.80	11.20
D—Open drain just before the junction with the conduit of Alston reservoir	3.50	26.60

As the above samples of water were more or less turbid when received, they were filtered to determine the amount of matter in suspension. The following were the results:

B—Roadside, bottom of village	0.64 per gallon
A—Conduit at Longridge, back of Wheat Sheaf	1.28 ,,
E—From open conduit, immediately before entering Grimsargh resevoir	1.60 ,,
C—Double conduit at Topping's farm	2.56 ,,
D—Open drain just before junction with the conduit of Alston reservoir	8.62 ,,

KEEPING PROPERTIES OF THE WATER.

A very important point to be ascertained was the keeping properties of these waters, and in order to accomplish this a sample of each of the five waters was kept for six weeks, at a temperature of about 70 Fahrenheit, when it was found that the samples of those from the north side of Longridge Hill, Cowley Brook, Dutton Brook, and Loudscales, had not acquired any taste or odour, neither did they present any appearance of fungus; whilst in the sample from the service reservoir, a large amount of fungus was generated, which imparted to the water a disagreeable flavor and repulsive appearance. There is no doubt that the production of the fungus was owing to the large proportion of organic matters present in the water.

The waters were examined under the microscope, to ascetain if they contained animalculæ, but none could be discovered. This period of the year (November) is however not the most favourable for the production of this lower class of aninals.

TESTING OF THE DEGREES OF HARDNESS.

The five waters were submitted to Clark's process for appreciating their relative degrees of hardness, and the following results were obtained:—

	Natural degrees per gallon.	*Boiled.*
Cowley Brook	1.25	1.25
North side of Longridge Hill	2.00	1.75
Dutton Brook	1.50	1.25
Loudscales	12.00	2.00
Service reservoir	4.40	4.15

From these results it is easily seen that the three first waters are exceedingly soft, and are highly suited for any domestic or manufacturing purposes. The value of this remarkable softness is not diminished by the small amount of other mineral salts, and by the organic matters they contain, principally the two first waters; but it is not so with the two last waters, principally Loudscales, which present a high degree of hardness. It is important that the degree of hardness should be known, being sufficient of itself to condemn the water as unfit to supply Preston; as the use of it would entail most serious expenses on the population of the town, and more especially of those who are the least able to bear them, namely, the working and poorer classes.

It is well known that every degree of hardness per gallon of water destroys 10 grains of soap, forming a useless and even injurious calcareous soap. From this data we can easily calculate what amount of additional expense the use of this water would occasion for every 100 gallons employed; 100 gallons of water from Loudscales at 12 degrees of hardness, will destroy about 27 ounces of soap, before any soap used can be rendered available as a detergent: now if we examine the quantity of soap rendered useless by 100 gallons of water from Cowley Brook, north side of Longridge Hill, and Dutton Brook, we shall find that it will only amount to about half an ounce, thus effecting a great annual saving to the population. For in a town like Preston, the value of soap employed, even for domestic purposes, would amount to several thousand

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pounds sterling per annum; and the benefit arising from the use of these waters will be increased, when it is considered that Preston is already a large town, and rapidly increasing in population. In many manufactories soap is largely employed; and we find that every piece of calico dyed in madder requires from one to four ounces of it; and often in a single print works, several thousand pieces are dyed per annum. Hard soap is used extensively for removing the gum from silk, and also for cleansing wool. But it may be argued that this water loses 10 degrees of hardness by boiling it for a short time, say half an hour, and that by using this precaution, manufacturers would save this large loss of soap; but if even so, it would involve the manufacturer in several serious expenses, such as loss of time and steam; and in the case of dyed madder cloth, the carbonate of lime thus separated would have an injurious effect.

It may also be stated that the 10 degrees of hardness may be removed by employing Clark's process of adding lime in the reservoir; but I cannot admit, with some gentlemen, that this process is one which can be applied with safety and regularity in the supply of such a large bulk of water as that which is required for a numerous population, even admitting that such a scheme could be adopted at a moderate expence. Is it not more simple, prudent, and wise, to take advantage of those natural and remarkable soft waters which are found near your town?

2nd.—The insoluble fatty salts of lime, produced when soap is brought in contact with mineral salts of lime contained in the water (usually called curds) gradually fix themselves on linen, during its washing, and communicate to it a peculiar yellow tinge, which cannot be afterwards removed by the subsequent processes to which it is usually submitted; and if by chance the water carries with it any coloring matter, as the Loud sometimes does, after rainy weather, it will be separated from the water by the insoluble calcareous soap, and become fixed on the cloth by this peculiar mordant. To remove the stains thus produced, not only an additional quantity of soap will be required, but more labour and loss of time.

3rd.—I shall again refer to some other evils which the use of this water will present, in the paragraph on the employ of the several waters examined in a domestic and manufacturing point of view.

With regard to the service-reservoir water it is difficult to give a positive opinion of its quality, as it is liable to change. Sometimes it contains a large proportion, and at other times a very small one, of carbonate of lime. Of course when it is charged with carbonate of lime, the above reflections on Loudscales water will also apply to it. This water presents a serious objection, which is not met with in any of the others; it has a permanent degree of hardness, of about 4 degrees, which is owing to the presence of soluble salts of lime and magnesia, which are not precipitated by boiling; therefore, this water cannot be rendered softer by boiling, as that from Loudscales. It has been argued by some persons, that such waters can be rendered soft by adding to them a small quantity of carbonate of soda; but the employ of this powerful detergent and softening agent is accompanied with three or four evils. 1st, It is an additional expense. 2nd, The slight excess which generally is used, will, in the case where calico or linen is repeatedly washed with it, if a slight excess is left in the tissue communicate to it a yellow tinge when dried near a fire. The 3rd disadvantage is, that the employ of carbonate of soda for purifying such waters is out of the question when they are to be employed in print works where madder goods are dyed; and they will always present an objection in all dye-works, and for silk boiling, &c. The 4th objection is, That an alkaline beverage must be considered as being attended with most serious evils to a large number of persons; such as those afflicted with calcareous gravel, lymphatic, scrofulous, and chlorotic diseases. It has, indeed, been remarked, that the waters best suited for that portion of a large population who lead a sedentary or close life, as in mills, &c., are those which are stimulant, by containing salts of iron; of course, where no other waters exist than selenic, or such as contain a large proportion of soluble salts of lime, not precipitable by boiling, then and then only, can such means be resorted to. The presence of sulphate of lime in this water is easily explained, when we reflect that it is principally derived from the surface drainage of several miles of land, containing, no doubt, a certain amount of gypsum.

(To be concluded in our next.)

CHEMICAL REPORT ON THE CAUSE OF THE FIRE IN THE 'AMAZON.'

BY PROFESSOR GRAHAM.

February 17th, 1852.

My Lords,

In reply to the questions arising out of the disastrous loss of the 'Amazon' by fire

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which are proposed to me for a Chemical opinion, I beg to submit to your Lordships the following statements and conclusions.

The practice of mixing together the various stores of the engineer, consisting of oils, tallow, soft-soap, turpentine, cotton waste and tow, and placing them in heated store-rooms contiguous to the boilers, must be looked upon as dangerous in no ordinary degree, for several reasons. Although oil in bulk is not easily ignited, particularly when preserved in iron tanks, still when spilt upon wood or imbibed by tow and cotton waste, which expose much surface to air, the oil often oxidates and heats spontaneously, and is allowed to be one of the most frequent causes of accidental fires. The vegetable and drying oils used by painters are most liable to spontaneous ignition, but no kind of animal or vegetable oil or grease appears to be exempted from it; and instances could be given of olive-oil igniting upon sawdust; of greasy rags from butter, heaped together, taking fire within a period of twenty-four hours: of the spontaneous combustion of tape-measures, which are covered with an oil-varnish, when heaped together; and even of an oil-skin umbrella put aside in a damp state. The ignition of such materials has been often observed to be greatly favored by a slight warmth, such as the heat of the sun. I am also informed by Mr. Braidwood, that the great proportion of fires at railway stations have originated in the lamp-store, and that in coach-works also, when the fire can be traced, it is most frequently to the painters' department, the fire having arisen spontaneously from the ignition of oily matters. Lamp-black and ground charcoal are still more inflammable, when the smallest quantity of oil obtains access to them, and should not be admitted at all among ships' stores.

The stowing metallic cans or stoneware jars of either oil or turpentine in a warm place is also attended with a danger which is less obvious, namely, the starting of the corks of the vessels, or the bursting of them by the great expansion of the liquid oil which is caused by heat. These liquids expand in volume so much as one upon thirty by a rise of not more than 60° of temperature, or by such a change as from the ordinary low temperature of 40° to a blood-heat; the latter temperature may easily be exceeded in an engine-room. It is remarkable that the burning a few years ago of a large steamer on the American lakes, which even surpassed in its fatality the loss of the 'Amazon,' was occasioned by the bursting, in the manner described, of a jar of turpentine placed upon deck too close to the funnel, by a party of journeyman painters who were passengers. This steamer was also on her first voyage, and being newly varnished, the flames spread over her bulwarks and extended the whole length of the vessel in a few minutes.

The bulkheads of coal holds appear to admit of obtaining considerable security from fire by being constructed double where close to the boiler, with a sheet of air between the two partitions. The tendency of coals to spontaneous ignition is increased by a moderate heat, such as that of the engine-room, from which they would be protected by the double partition. I have obtained instances where coals took fire in a factory, on two different occasions, by being heaped for a length of time against a heated wall, of which the temperature could be supported by the hand; also of coals igniting after some days upon stone flags covering a flue, of which the temperature was not known to rise above 150°, and of coals showing indications of taking fire by being thrown in bulk over a steam pipe. These were Lancashire coals, which are highly sulphureous; but the same accident occurred with Wallsend coals, at the Chartered East Company's works in London, where the coals were twice ignited through a two-feet brick wall, of which the temperature was believed by Mr. Croll not to exceed 120° or 140°.

The surface of deal in the partition opposed to the boiler would probably be better protected from fire by impregnating the wood with a saline solution which diminishes combustibility, such as the zinc solution of Sir W. Burnett, rather than by coating the wood on the side next the boiler with sheet iron. Indeed, this use of iron appears to introduce a new danger. The iron being a good conductor of heat, the wood below is heated nearly as much as if uncovered, and wood in contact with iron appears to be brought by repeated heating to an extraordinary degree of combustibility, and to become peculiarly liable to spontaneous ignition.

Mr. Braidwood, who has been led to that conclusion, gave an instance of wood covered by sheet iron igniting spontaneously in a wadding manufactory. The numerous occasions, also, on which wood and paper have been ignited by Perkins' heated water pipes, equally exemplify the dangerous consequences which may arise from moderately heated iron in long contact with combustible matter.

The most obvious precautions for guarding against the spontaneous ignition of coal

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stowed in ships' bunkers appear to be the taking the coal on board in as dry a condition as possible, and the turning it over, if there is room for doing so, as soon as the first symptom of heating is perceived. An obnoxious vapor is described as always preceding the breaking out of the fire, and affords warning of the danger. The ignition of Newcastle coals in store is not an unfrequent occurrence at the London gas-works. It appears always to begin at a single spot, and is met by cutting down upon and removing at once the heated coals. Long iron rods are placed upright in the coal heap, which can be pulled out, and indicate by their warmth the exact situation of the fire. Steam can be of little avail for extinguishing fire among coals in bulk; and water, although it may extinguish the fire for the time, is too apt to induce a recurrence of the evil.

For extinguishing a fire occurring in berths or cabins in the immediate vicinity of the boiler and engine-room, steam might be more advantageously applied, means of turning on the steam being provided upon the upper deck, or other distant place of safety. Steam, however, can only be said to be efficient in extinguishing flame, or a blaze from light objects, and is not to be relied upon beyond an early stage of a fire. Upon a mass of red-hot cinders the extinguishing effect of steam is insensible.

An essential condition of applying steam with success to the extinction of a fire in the engine-room, would be to prevent the rapid ingress and circulation of the air at the same time, which is occasioned by the draught of the fires. This could only be done completely by valving the chimneys: for the quantity of heated air passing off by the funnels greatly exceeds in volume the steam produced by the boilers in the same time, and would rapidly convey away the steam thrown into the atmosphere of the engine-room, and prevent any possible advantage from it.

The fire in the 'Amazon' appeared to the witnesses to take its rise either in the small oil store-room situated over the boiler, or in a narrow space of from three to eleven inches in width between a bulk-head and the side of the boiler, immediately under the same store-room. No substance remarkable for spontaneous ignition, such as oiled cotton waste, was actually observed in the store-room, or the space referred to. The wood itself of the bulkhead, which was within a few inches of the boiler, may have been highly dried and sensibly heated by its proximity to the latter, but is not likely to have acquired any tendency to spontaneous ignition: for when that property results from low heating, it is an effect of time, requiring weeks or months to develop it. The same observation applies to the decks in contact with the steam-chest which incased the base of the funnel.

Nor does it appear probable that the coals in the coal-hold of the vessel gave occasion to the fire by heating of themselves, and then burning through the wooden partition of the oil-store with which they were in contact.

These coals were from Wales, and not remarkable for this property.

They are also said to have been shipped in a dry and dusty state, and not damp, a month or two previously.

Their ignition would also have been preceded by the strong odor before referred to, which does not appear to have been remarked, although the coal-hold communicated directly with the boiler-room.

Oil was seen to drop from the floor of the store-room upon the top of the boiler, but not in greater quantity than might be accidentally spilt in drawing the oil from the tank for the use of the engineers.

A parcel of twenty-five newly-tarred coal-sacks, which had been thrown upon the boiler, also obtained, it is supposed, some of the same oil. This oil appears to be the matter most liable to the possibility of spontaneous ignition, which was noticed near the spot where the fire commenced.

But the sudden and powerful burst of flame from the store-room, which occurred at the very outset of the conflagration, suggests strongly the intervention of a *volatile* combustible, such as turpentine, although the presence of a tin can of that substance in the store-room appears to be left uncertain. It was stated to be there by two witnesses, but its presence is denied by a third witness. I find upon trial, that the vapor given off by oil of turpentine is sufficiently dense, at a temperature somewhat below 110°, to make air explosive upon the approach of a light. Any escape of turpentine from the heated store-room would therefore endanger a spread of flame, by the vapor communicating with the lamps burning at the time in the boiler-room, or even with the fire of the furnaces.

The fire appears not to have begun in the tarred sacks lying upon the boiler, although from their position, which was close to the store-room, they must have been very early involved in the conflagration, and contributed materially to its intensity. The sacks appear to have been charged each with about two pounds of tar, thus furnishing together fifty pounds of that sub-

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stance, in a condition the most favorable that can be imagined for rapid combustion. The freshness of the tar and its high temperature would make it ignite by the least spark of flame, although not prone to spontaneous ignition. The burning of a group of newly-tarred cottages in Deptford, which came under the notice of Mr. Braidwood, arose from their being set on fire by lightning, while the sun was shining upon them, and the tar liquefied by the heat.

The origin of the fire must remain, I believe, a subject of speculation and conjecture; but the extreme intensity and fearfully rapid spread of the combustion are circumstances of scarcely inferior interest, which are not involved in the same obscurity.

The timber of the bulkeads and decks near the engine-room is reported to have been of Dantzic red wood or Riga pine, and such was the character of a portion of the 'Amazon's' timber which was supplied to me for chemical examination. The wood has had its turpentine drawn off, and differs in that respect from pitch pine. The Dantzic red wood, is, in consequence, less combustible than pitch pine, but more porous and spongy. Oil-paint is absorbed, and dries more quickly upon this porous wood than upon oak and other dense woods. After their paint is well dried, pine and other woods certainly acquire from it some protection from the action of feeble and transient flames, which might kindle the naked wood. But the effect of paint, especially of fresh paint, appears to be quite the reverse, when the wood is exposed to a strong although merely passing burst of flame. The paint melts and emits an oily vapor, which nourishes the flame and soon fixes it upon the wood. There can be no doubt, therefore, that the timber of the 'Amazon' was in a more inflammable state than ship-timber usually is, from being recently painted, and also probably from its newness and comparative dryness.

But the circumstance which appears above all others to give a character to the fire in the 'Amazon' was its occurrence, not in a close hold or cabin, but in a compartment of the vessel where a vigorous circulation of air is maintained by the action of the boiler-fires and their chimneys. The air of the engine-room must be renewed under this influence every few minutes, and would be so although full of flames rising above deck through the hatchways; for a portion of these flames would always escape by the funnels, and add to their aspirating power instead of diminishing it. The combustion of bulkheads or decks once commenced in this situation would therefore be fanned into activity and powerfully supported.

The destruction of the oil store-room, and the overturning, in consequence, of the oil-tanks and combustibles into the well of the boiler-room, was probably the crisis of the fire. A mass of combustible vapor would speedily be generated, and shot about on all sides, of which the kindling power upon the new and painted timber of the bulkheads and decks would be wholly irresistible.

The burning of the 'Amazon' impresses most emphatically the dangerous and uncontrollable character of a fire arising in the engine or boiler room, where the combustion is animated by a steady and powerful circulation of air, and the danger of collecting combustible matter together in such a place. The removal of the oil stores to a safer locality is, fortunately, generally practicable, and is the measure best calculated to prevent the recurrence of any similar catastrophe.

I have the honor to remain, &c.

THOS. GRAHAM.

To the Lords of the Committee of Privy Council for Trade.

NINTH COMMUNICATION ON THE BATTERY.

BY M. C. DESPRETZ.

ON THE LAW OF GALVANIC CURRENTS.

IN my last communication, (see THE CHEMIST, July, 1852, p. 436), I called the attention of physicists to what must be understood by constant batteries, to the solutions which give batteries as constant as possible, to the phenomena which render certain batteries very variable, to the increase of intensity after interruption, and, finally, to the greater or less oscillations presented by all batteries in the course of the experiments.

I did not undertake this work directly; I was led to do so by the difficulties which I had met with in various experiments, and especially in those the results of which I had the honor of presenting to the Academy.

ON THE LAW OF CURRENTS.

I. The first researches which showed that in a metallic wire the intensity of an electric current is in the inverse ratio of the length, and in the direct ratio of the section, was published by Sir Humphrey Davy in the Philosophical Transactions for 1821.

Since then, M. Becquerel, by a more accurate process, has put the law enunciated beyond all doubt.

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In these experiments, the battery was considered only as a machine producing the current; it was not known what influence it might exert on the length of the total circuit; what length of wire of a given diameter and determined conductibility it represented; thus, in the experiments of Sir H. Davy and M. Becquerel, a condition independent of the battery was assumed. A large or small battery, a good or bad conductor, would have led to the same results and to the same consequences.

II. In 1825, Ohm, then professor at Cologne, began to publish works on the battery.

From the ideas which were formed of the nature of electricity, he was led to think that the propagation of electricity in conductors occurs like heat from one layer to the next, with a speed proportionate to the difference of the intensities. He introduced this hypothesis into the calculation, and, by applying to the motion of electricity the methods which had been applied to different subjects by M. Fourier, M. Laplace and M. Poisson, he was enabled to solve the various questions presented by the battery whose poles are united by simple or compound, homogeneous or heterogeneous wires; he published in 1827 a work entitled: *Die galvanische kette mathematische bearbeitet*, in which are collected the various portions of his work, and the consequences which he has deduced from them.

We shall not occupy ourselves here with the question as to whether the hypothesis from which Ohm sets out is or is not conformable to the nature of things. It is sufficient for the consequences which he has drawn from his work to be proved for the service rendered to science to be very considerable.

Before the publication of his work, Ohm confirmed his ideas by the experiment with single liquid batteries, and with thermo-electrical batteries. He gave the formula:

$$I = \frac{nE}{nR + L}$$

for the expression of the intensity of a current produced by a voltaic battery composed of n elements; R represents the resistance of one element, L that of the conductor which unites the poles, and E what Ohm calls the electro-motive force.

Fechner afterwards made numerous experiments on the same matter; he considered the results at which he arrived as the confirmation and completion of Ohm's work.

Our colleague, M. Pouillet, without any knowledge of the works of the German physicist, as he declared on several occasions, devoted himself to the study of the laws of currents even before the intensity-constant batteries were known. The results of his important and numerous researches on simple or multiple currents are given in detail in works on physics.

It is now generally admitted that the intensity of a current is in the inverse ratio of the resistance of the total circuit, that is to say, in the inverse ratio of the resistance presented by the battery, augmented by the resistance of the exterior conductor.

Some physicists, however, doubt the complete accuracy of this law, and it will be seen, in this memoir, that it is not surprising that some experimentalists have not found it strictly correct in the conditions in which they were placed.

We should not occupy ourselves with this subject, after the extended experimental work of M. Pouillet, did not several physicists appear to be convinced of the inaccuracy of the law.

III. Our first researches did not furnish satisfactory results, because, in the first place, the batteries which we employed were not sufficiently constant, and, in the second, we supposed the rheostat uniform throughout its extent, a supposition the error of which we afterwards discovered.

Our rheostat consisted of a rectangular frame, of 25 centimetres broad, and 1·50 millimetres high; on this frame, whose angles, covered with several layers of gum lac, present slight grooves, the copper wire, of 1 millimetre in diameter, and enveloped with silk ribbon at the part touching the varnished wood, was bent. The wire was held at its two extremities by two glass cylinders, fixed in the wood and varnished with gum lac. At two of the angles, a divided scale was traced.

We have already stated that in making these experiments on the law of currents, that we were stopped many times by the inconstancy of the battery.

IV. Although the method which we followed accounts in principle to that employed by the physicists who have treated the same matter, since it consists in introducing wires of different lengths into the circuit of the battery, and in noting the corresponding deviation of a compass placed in the same circuit; still, we think it necessary to point out the precautions which we took to avoid causes of error, and to arrive at accurate results, in order that a better judgment may be formed of the confidence which our work on so delicate a subject deserves, and perhaps, besides, attention has not been paid to all the circumstances on which we have fixed our attention.

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We selected, after the experiments detailed in the eighth communication, Daniell's battery, charged with common salt dissolved in 10 parts of water by weight; this battery, thus mounted, ordinarily undergoes only very slight variations during five or six hours, a length of time sufficient for all measurement experiments.

Sulphate of soda may replace common salt, even with advantage as regards constancy, but not as regards power.

We observed the deviations by means of a compass with tangents, which we shall describe in our tenth communication. Although we had set the circle of the current and the divided circle with all the care possible, we always took the deviation to the right and to the left; it was the mean of the two deviations, differing very little, which served for calculating the intensities.

As it was not doubtful that the law, admitted by the majority of physicists, and considered not accurate by some others, must be at least approximatively correct, which was proved, moreover, by the researches of those who, by their experiments had been led to deny its absolute accuracy, we have been induced to compare the corresponding intensities of three different circuits; the first circuit was composed of the battery, the compass and its conductors; the second comprised, besides, 10 metres of copper wire of 1 millimetre in diameter; and the third, 80 metres of the same wire.

In order that the results might not be affected by the slight unavoidable variations of the battery, we made our observations in the following order:—

1. First circuit of the compass without additional wire:
2. Circuit with additional wire (10 metres):
3. First circuit:
4. Third circuit with additional wire (80 metres).
5. First circuit:
6. Second circuit with additional wire (10 metres):
7. First circuit.

The mean of the first and third deviations may be considered as representing the deviation which would be obtained in the first circuit at the moment when it occurs in the second; with this mean and the second deviation, we calculate a first value of the resistance by the formula

$$R = \frac{Li}{I - i},$$

in which L represents the length of wire added, i the intensity of the circuit which contains the additional wire, and I the intensity of the circuit composed of the battery and the compass.

Deviation 4 and the mean of deviations 3 and 5 give us a new value of the resistance R′.

Finally, we obtained a third value R″ by deviation 6, and the mean of deviations 5 and 7.

The mean of the values R and R″ may be regarded as the resistance corresponding to 10 metres of additional wire, obtained at the moment at which the intensity is taken after having introduced 80 metres of wire into the circuit. If this law be admitted as strictly correct, R′ should not differ from $\frac{R+R''}{2}$

In order that these experiments might possess some value, it was necessary that the 80 metres of wire added should be equal for the resistance to 8 times the 10 metres at first added. To fulfil this condition, we graduated our rheostat into parts of equal resistance; we made this graduation in the following manner.

Having noted by the compass the deviation with 10 metres of wire introduced into the primitive circuit, we endeavored to discover what length it would be necessary to take in continuation of these first 10 metres to produce the same deviation, and we marked the extremity of this length 20 metres; we took the deviation corresponding to the first 10 metres, and we sought at the continuation of the 20 metres a new interval of equal resistance the extremity of which we marked 30 metres, and so on up to 80 metres, always comparing the new intervals with the first 10 metres.

Four series of experiments performed with the graduated rheostat, gave, as a mean, the following results:—

$\frac{R+R''}{2}$	R′	Difference in centimetres.	Difference in thousandths of mean value.
6·651m	6·697m	0·046m.	6·9

V. Other experiments, in very great numbers, were made before the rheostat was divided into parts of equal resistance; the results of these experiments must undergo a certain correction.

The length which we called 80 metres in the foregoing experiments, because it represents eight times the resistance of the first 10, was in reality only 78·35m., so that, when we took 80 metres of real length for 80 metres of resistance, we committed a notable error; these 80 metres of length represented, indeed, a length of 81·684m. of wire of a resistance equal to that of the wire of the first 10 metres; the results obtained with the 80 metres of additional wire

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of real length must therefore be multiplied by 81·684.

80

The mean of six series thus gives 8·20 m. for the resistance corresponding to 10 metres, and 8·259 m. for the resistance corresponding to 80 metres.

The difference 0·059 in favor of the large circuit, is equivalent to 7 thousandths.

VI. In a third series of experiments, we proceeded in such a manner as to be free from the want of equality of resistance of the rheostat, a defect which all rheostats must present, because it is very difficult indeed for a metallic wire of a certain length to be identical in its entire length with regard to electrical conductibility.

We calculated, at first, a first value of R with the first 10 metres of the rheostat, and a second value with the 80 metres of real length, and then a third value with the 10 metres of real length, in continuation of the first 10, and a fourth with the 80 metres, and so on. We obtained, in this manner, eight values of R calculated with 10 metres of wire, taken in 8 different positions of the rheostat, and eight with 80 metres embracing the eight positions. It is well understood that, in each experiment, the method of the corresponding experiments was followed, although the battery was perceptibly constant.

The mean of the first values was 7·74.

The mean of the second 7·80.

Difference 0·06m., or 7·7 thousandths.

VII. To sum up, the mean of the values of R obtained with 80 metres of additional wire, is superior by 7·2 thousandths, or $\frac{1}{139}$ to the mean of the values obtained with 10 metres. The difference is always in the same direction, in favor of the resistance calculated with the greatest length of wire added.

Our experiments have been too numerous and in conditions too various for the difference to be the result of an error of observation or of a fortuitous circumstance; this difference of values of the resistance of the battery, with unequal lengths of wire added to the circuit, is a consequence of the nature of the instrument* whose resistance is sought for; no battery, in our opinion, will give two exactly equal values, for two different lengths of wire.

This want of absolute equality in the resistance of the battery, calculated with two circuits of different lengths, is owing, if we may so speak, to the incrusting of the zinc.

We have already called the attention of physicists to this latter point. (See THE CHEMIST, July, 1852, p. 436).

We have mentioned the increase of intensity after the rupture of the circuit maintained for one or more minutes; we have detailed some experiments which presented oscillations.

We have seen that an addition of a certain length of wire causes them to disappear. All these phenomena, which are explained by the incrusting of the zinc, are due to the same cause.

In a battery, especially in an active battery, the sulphate of zinc does not dissolve so fast as it is produced; there is formed, around the metal, a kind of varnish, which is a bad conductor, and which has the effect of reducing the active surface of the zinc; whence results a weakening of the current, which is so much the more marked as the intensity of the current or the chemical action is more powerful. If this explanation is conformable to the nature of things, and we venture to say that we are fully convinced of its justice, it is easy to account for the difference proved. Indeed, when we introduce into the circuit of the battery 10 metres of additional wire, the chemical action is diminished, and so, consequently, is the incrusting of the zinc; we observe an intensity i rather more powerful than would have been found, if the zinc had remained exactly in the state in which it was at the moment when the intensity I was determined with the primitive circuit, and consequently the resistance R calculated by means of the formula $R=\frac{L\,i}{I-i}$ is rather greater than it should be.

When, instead of 10 metres, 80 metres are introduced into the primitive circuit, the same effect is produced, but in a more marked degree; and, consequently, the value of R should exceed the real resistance of a greater quantity than in the first case.

M. Marié (*Annales de Chimie et de Physique*, 3e Série, tomes xix et xxii) found results completely at variance with the law of currents, and which deviated in the direction of the slight difference which we have ourselves proved. We have not repeated M. Marié's experiments, but we are inclined to think that the incrustation of the zinc in the battery which he employed, must be very considerable, and this, doubtless, is the reason why he found results at variance with the law.

* We had at first thought that the difference observed was owing to the electricity, after having passed through a certain length of a conductor becoming more apt to traverse the same conductor.

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M. Delezenne, a physicist well known to the Academy, discussed, in 1848, in a profound manner, the most modern experiments on the subject under consideration: we regret that we are not able here to give in detail the learned discussion entered into by the distinguished professor of Lille.

VIII. To sum up;

The law of currents comprises in its enunciation two distinct things:—

1. The intensity of the current of the battery is in the inverse ratio of the sum of the resistances of the circuit (the resistance of the battery being comprised in this sum).

2. The resistance of the battery is of constant power, independent of the modifications which the remainder of the circuit may undergo.

We believe that the first proposition is always strictly true; but we think that the second, which may deviate considerably from truth in batteries in which the action is very energetic, is so much the more accurate as the battery is weaker.

The law of currents, which is one of the most beautiful acquisitions of the history of galvanism, and which is an indispensable and certain guide in an infinity of experiments on the battery, is true in itself, but it should be regarded as strictly accurate only in conditions in which it really can be so.

We even think that it has never been verified with so much approximation as in this memoir.—*Comptes Rendus*, No. 21, May 24, 1852.

ON THE PREPARATION OF PURE BARIUM COMPOUNDS.

BY HENRY WURTZ.

THE preparation of the compounds of barium in a state of absolute purity is a subject which has not generally received much attention from Phamaceutical chemists, in consequence of the hitherto limited application of these compounds, except in chemical analysis. The time, however, is undoubtedly close at hand, when new developments in the arts, will create a demand for pure barium compounds, as well as for many other products now considered as pertaining exclusively to the laboratory. Indeed, efforts have already been made to introduce the *chlorate of barytes* to the notice of pyrotechnists as a means of producing a green fire unequalled in beauty, and the pure carbonate has been for some time in use in England, in the manufacture of superior variety of plate glass. The precipitated native sulphate is also preferred as a water color pigment to white lead, being far more durable than the latter. I may here be permitted to mention a practical application of the carbonate which has occurred to myself. I have found that sulphate of lime is totally precipitated from its solution by mixing therewith an eqivalent quantity of the precipitated or finely pulverised natural carbonate of barytes, of course with the formation of sulphate of barytes and carbonate of lime. It is by no means improbable that this property may be made available in removing sulphate of lime from spring or sea water which is to be used in steam boilers, thus preventing the formation of the troublesome incrustation which so often occurs, especially when it is considered that the sulphate of barytes which would be formed, might easily be reconverted into carbonate and be used over again. Again, sulphate of lime might be removed in the same way from the brine in salt works, thus contributing to the purity of the salt produced. Recent improvements in chemical analysis have greatly increased the usefulness of barium compounds in the laboratory, especially of the carbonate, to which the late investigations of Professor H. Rose, and of Ebelmen have given a place in the very first rank among the reagents valuable to the chemist. Any suggestion, therefore, concerning the preparation of barium compounds in a pure state, cannot be considered as useless.

The sulphate of baryta is the only compound which occurs in sufficient abundance to be an economical source or the other barium compounds, and the enormous though illegitimate use of this substance in the adulteration of white lead, is so far fortunate as to render it an easy matter to obtain it in any required quantity, already in a state of fine powder which is so desirable in chemical operations.

The sulphate of baryta is always reduced to the state of sulphide of barium, by exposing it to a red heat in intimate admixture with some carbonaceous substance, such as powdered charcoal, rosin, oil or flour. It is exceedingly difficult, however, if not impossible, to effect in this manner a complete decomposition of the sulphate. Indeed, it is probable that in most cases the quantity of sulphide obtained, is not more than half that which is equivalent to the sulphate employed. A modification which promises to be far more economical was proposed by Dr. Wolcott Gibbs. His proposal was to submit the sulphate to the reaction of a current of common coal gas at a red heat. It is evident that in this way a perfect decom-

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position may readily be accomplished, especially if the powdered sulphate is stirred during the operation, so as to expose fresh surfaces to the action of the gas.

The mass obtained after the reduction of the sulphate is submitted to the action of boiling water, and a solution obtained, which, according to Professor H. Rose,* contains principally hydrate of baryta and sulphohydrate of sulphide of barium Ba S. HS. formed by the reaction of equal equivalents of water and proto-sulphide of barium. It almost invariably contains also a quantity of lime, probably in the form of sulpho-hydrate of sulphide of calcium, or of hydrate of lime proceeding from the almost constant concurrence of sulphate of lime with native sulphate of baryta. From the presence of this lime originates the principal difficulty in preparing pure barium compounds from this substance. Thus when the carbonate is prepared from the solution by precipitation, with carbonate of soda, or a current of carbonic acid gas, it is found contaminated with carbonate of lime, which is fatal to its use as a reagent in analysis. Also in examining many specimens of commercial *chloride of barium*, which is prepared from this solution by the addition of chloro-hydric acid, boiling to separate sulpho-hydric acid gas which is evolved, filtration to separate the sulphur which is precipitated and crystallization, I have always found it to contain a small quantity of chloride of calcium, which I have found it impossible to separate entirely by repeated recrystallizations. It has been proposed† to separate the chloride of calcium from chloride of barium by the use of very strong alcohol, in which the latter when anhydrous, is insoluble. This method is rather expensive and troublesome as it involves the evaporation to dryness of the chloride of barium solution, the reduction of the previously ignited residue to a very fine powder and digestion in strong alcohol.

Attempts were made after some previous experimentation, in which it was found that an aqueous solution of *oxalate of baryta* precipitated chloride of calcium, but not chloride of barium, to separate the lime from a chloride of barium solution by addition of oxalate of baryta, or simply of a little oxalic acid, but it was soon found that oxalate of lime was somewhat soluble in a solution of chloride of barium, so that a solution of oxalate of baryta, gave no precitate in a mixture of solutions of chloride of barium and chloride of calcium. It was found also that the precipitate formed by a little oxalic acid in a lime solution, could be re-dissolved by addition of chloride of barium. It may also be mentioned, though irrelevant to the subject, that it was found that oxalate of lime was soluble in solutions of chloride of calcium, of ammonia, and of chloro-hydrate of ammonia.

The well known property of carbonate of baryta which the recent investigations of Professor H. Rose have rendered so important in the analysis of phosphates, of completely precipitating lime from its solution by a sufficiently long contact therewith, furnishes, us, however, with a perfectly easy and cheap method of purifying the chloride of barium solution. In fact a solution of chloride of barium to which chloride of calcium has been added, having been treated with a little carbonate of baryta, and allowed to stand in contact with it for two days, with occasional agitation, was found on filtration to be free from lime. The only objection to this method, is the considerable length of time required; but I must here describe an elegant modification which was communicated to me by Dr. Wolcott Gibbs, and tested by him in his laboratory; that is to add first to the solution of chloride of barium containing lime, a little solution of hydrate of baryta and then to pass through it a current of carbonic acid gas. The precipitate immediately formed contains of course all the lime.

The only impurity which is prevalent in commercial chloride of barium besides lime, is strangely enough, a trace of *lead* which is almost always present and sometimes in such quantity that the solution is immediately blackened by sulphuric acid.* This is, however, very easily removed, either before or after the separation of the lime by the process of Dr. Gibbs, by passing a little sulpho-hydric acid gas into the solution, gently heating for a short time and filtering.

Commercial chloride of barium thus purified is probably the most convenient source of the other compounds of barium when required pure. Thus pure carbonate of baryta may be prepared from it by precipitation with carbonate of ammonia, or with carbonate of soda, which is free from silica, sulphuric acid and phosphoric acid.† —*New York Journal of Pharmacy*, June, 1852.

* Poggendorff's Annalen, 55, 416.
† Gmelin's Handbuch, 2, 158.

* It may be that leaden pans are used for evaporation or crystallization of the commercial chloride of barium, which would sufficiently account for the presence of lead in the product.

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NOTE ON SOME NEW ARSENITES.

BY M. GIRARD.

When ordinary arsenite of potassa, AsO^3, 2KO, is poured into a salt of cobalt, nickel or silver, the arsenite precipitated is bibasic like the precipitant, and has the formula $AsO^3 2MO$.

This is no longer the case when these metals are operated on in the presence of ammoniacal salts. The arsenites which are formed in this case differ essentially from the ordinary arsenites. They are sesquibasic $2AsO^3 3MO$, and the precipitation gives rise to an abundant disengagement of ammonia.

Thus if we take chloride of nickel dissolved in a very great excess of hydrochlorate of ammonia, and rapidly pour into it arsenite of potassa, the liquor is at once colored blue, without forming any precipitate; ammonia is disengaged, then almost immediately the liquor becomes turbid and deposits a body of a greenish white which contains water, arsenious acid and oxide of nickel.

To analyse this salt, we employed several processes. First we boiled the salt with tin and nitric acid, so as completely to separate the arsenic, according to M. Levol's process, and after filtering the liquor, the nickel was precipitated by means of potassa. The arsenious acid was estimated separately by dissolving the arsenite in hydrochloric acid and pouring into it a solution of permanganate of potassa of known strength, according to M. Bussy's process.

Finally, we employed the following process, which may be applied to the compounds of arsenic and metals soluble in ammonia. After having boiled the salt with nitric acid until no more red vapors were disengaged, we saturated the nitric solution with ammonia, redissolved the precipitate formed, and added a solution of chloride of barium to the ammoniacal solution; the whole of the arsenic was precipitated in the state of arseniate of baryta.

In the filtered ammoniacal solution, the nickel was afterwards estimated by precipitating it in the state of sulphuret, dissolving in nitric acid and precipitating by potassa.

A great number of analyses of this salt gave us as a mean:—

Oxide of nickel	36.4
Arsenious acid	63.6
	100.0

which corresponds to the formula $2AsO^3$, 3NiO; which requires:—

Oxide of nickel	36.2
Arsenious acid	63.7
	99.9

Dried at 230°F., it loses 10.3 per cent. of water, which corresponds to 4 equivalents. Its formula is therefore $2AsO^3$, 3NiO, 4HO.

This salt is of a greenish white; heated in contact with the air, it loses its water at once and becomes of a rather deeper green, then it gives a sublimate of arsenious acid and leaves as a residue a yellow powder which does not fuse. This body still contains arsenic, and does not decolor camelion; it presents all the characters of arseniate of nickel, and, moreover, the quantity of arsenic lost by the calcination corresponds exactly to 1 equivalent of arsenious acid less 2 equivalents of oxygen necessary for making arsenious acid pass to the state of arsenic acid:—

$$2AsO^3\ 3NiO + 2O = AsO^5\ 3NiO + AsO^3$$

The manner in which this salt acts on being calcined distinguishes it from the ordinary arsenite which becomes black.

Nitric acid decomposes it and converts it into arseniate. Hydrochlorc acid decomposes it into arsenious acid and chloride of nickel, which may be obtained in the crystalline state by concentrating the liquor; it is dissolved in ammonia and gives a violet liquor. Caustic potassa decomposes it with the aid of heat, and precipitates black oxide of nickel.

Chloride of cobalt gives in the same manner an abundant disengagement of ammonia and a precipitate of a delicate rose color, much lighter than the ordinary arsenite, whilst a portion of the cobalt enters into solution by means of the ammonia.

Submitted to the same mode of analysis as the salt of nickel, this salt gave us as a mean:—

Oxide of cobalt	36.2
Arsenious acid	63.2

which corresponds to the formula $2AsO^3$ 3CoO, which requires

Oxide of cobalt	36.2
Arsenious acid	63.7

The salt contains besides 10.3 per cent of water which corresponds to 4 equivalents. Its formula is, therefore $2AsO^3$ 3CoO 4HO.

This arsenite is of a delicate rose color when it is recently precipitated, and deeper when it is agglomerated; it is soluble in ammonia and gives a blue solution. When it is heated, it loses its water at once, and its tint becomes deeper, then it is decomposed, gives a sublimate of arsenious acid, and leaves as a residue a body of a fine blue color which enters into fusion and assumes, on cooling, the form of a crystalline mass.

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Caustic potassa decomposes it with heat, and separates from it blue oxide of cobalt. Nitric acid dissolves it, converting it into arseniate. Hydrochloric acid also decomposes it.

Nitrate of silver put in contact with a great excess of nitrate of ammonia gives, when arsenite of potassa is poured into it drop by drop, a disengagement of ammonia and a perfectly white precipitate of sesquibasic arsenite of silver.

To analyse it, we dissolved it in nitric acid and converted it into arseniate, precipitated the silver by hydrochloric acid, and to the filtered liquor, saturated with ammonia, added chloride of barium which gave us the arsenic in the state of arseniate of baryta. We thus obtained:—

Arsenious acid	36.4
Oxide of silver	63.2

These numbers correspond to the formula $2AsO^3 3AgO$, which requires:—

Arsenious acid	36.5
Oxide of silver	63.5

This salt turns black in the light, and dissolves in ammonia and in an excess of arsenite of potassa. Nitric acid decomposes it, disengaging nitrous vapors, and converts it into calcined arseniate; it becomes black at once, gives a sublimate of arsenious acid, and finally leaves a residue of a fine red, which enters into fusion, and seems to be arseniate of silver. Calcined with charcoal, it gives a metallic residue.

These salts, are easily distinguished from the ordinary arsenites by their color and the effect produced upon them by calcination

As regards the theory of their formation, a few facts may aid in interpreting it:

1. Hydrochlorate of ammonia reacts on arsenite of potassa to form acid arsenite of potassa $AsO^3 KO$, chloride of potassium and ammonia.

$$AsO^3\ 2KO + ClH,\ NH^3 = AsO^3,\ KO + KCl + HO + NH^3$$

2. The acid arsenite of copper is soluble in the hydrochlorate of ammonia, for, when we pour into chloride of cobalt acid arsenite of ammonia $AsO^3\ NH^3$, no precipitate is formed, because the hydrochlorate of ammonia formed by double decomposition dissolves the acid arsenite of cobalt.

3. The neutral arsenite of cobalt $AsO^3\ 2CoO$, is also soluble in hydrochlorate of ammonia.

So that, when arsenite of potassa is poured into the mixture of chloride and hydrochlorate of ammonia, the arsenite reacts on the hydrochlorate of ammonia forming acid arsenite of potassa, which precipitates acid arsenite of cobalt; the latter is dissolved like the neutral arsenite $AsO^3 2CoO$, and these two soluble arsenites combine

$$AsO^3 CoO + AsO^3 2CoO = 2AsO^3\ 3CoO$$

to form the sesquibasic arsenite.

It would be the same for silver and nickel.—*Comptes Rendus*, No. 24, June 14, 1852.

ON SEVERAL NEW SULPHITES OF THE OXIDES OF MERCURY AND COPPER.

BY M. L. PEAN DE SAINT-GILLES.

First Part.—The Sulphites of Mercury.

The existence of the sulphites of mercury seems to have hitherto escaped the researches of chemists. In 1846, in a note contained in the *Revue Scientifique* of Dr. Quesneville, M. Rammelsberg announced that he had prepared a sulphite of mercury by the action of sulphurous acid on oxide of mercury. I am convinced, from detecting in the product indicated the properties of oxide of mercury and sulphuric acid, that this salt is simply a mixture of sulphate and sulphite of mercury. The oxide of mercury may besides be entirely dissolved in the aqueous solution of sulphurous acid, and, before the spontaneous decomposition of this liquor, it is easy to ascertain that it contains neither oxide of mercury, nor sulphuric acid, essential indications of reduction.

The means of obtaining the sulphite of mercury in the solid state, without admixture of sulphate of mercury, consists in mixing a syrupy solution of nitrate of mercury containing an excess of base, with a solution of an alkaline sulphite, diluted with eight or ten times its bulk of water. The deposition of a white heavy and caseous precipitate of sulphite of mercury is thus caused, in which the proportions of the base vary with those of the nitrate employed, that is to say between the two proportions HgO,SO^2 and $2HgO,\ SO^2$ The difficulty of preparing in the state of absolute purity one of the two nitrates HgO,NO^5 or $2HgO,\ NO^5$, in very concentrated solution, added to the instability of the simple mercurial sulphite, prevents us from completely isolating the two sulphites corresponding to the nitrates. The neutral salt especially appears more unstable than the basic salt, which I have obtained almost pure; in this salt, the sulphite $2HgO,SO^2$ presents a remarkable reaction; under the influence of a not very elevated temperature it is completely converted into sulphate of

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mercury, without separating any of its elements. Indeed:—

$$2HgO, SO^3 = Hg^2O, SO^3.$$

The mercurial oxysalts other than the nitrate do not produce simple sulphite of mercury in the same conditions. The alkaline sulphates reduce or dissolve them partially.

None of the haloid salts of mercury are reduced without heat by the soluble sulphites: The mixture of chloride of mercury and alkaline sulphites gives rise to the production of the following double salts, remarkable for their clearness and stability.

I. SULPHITE OF MERCURY AND POTASSA.

$$HgO,SO^2, KOSO^2, HO.$$

Sulphate of potassa appears to combine with only one proportion of sulphite of mercury. The double salt is deposited in small, white needles, by the mixture of two concentrated solutions of chloride of mercury and sulphite of potassa. It is neutral to litmus paper.

II. SULPHITES OF MERCURY AND SODA. SULPHITE A:—

$$HgO, SO^2, NaOSO^2, HO.$$

It crystallises in well defined rhombohedral tables. It is produced in the same conditions as the foregoing; but as it is more soluble, we are obliged to evaporate the liquor in presence of an excess of alkaline sulphite. Iodide of potassium does not precipitate its aqueous solution.

SULPHITE B.

$$2(HgO, SO^2), NaOSO^2, HO.$$

It is obtained in crystalline needles, when hot concentrated solutions of sulphite of soda and chloride of mercury in slight excess are mixed. Its solution presents a very alkaline reaction, and abandons half of its mercury, when iodide of potassium is added.

III. SULPHITE OF AMMONIA WITH CHLORIDE OF MERCURY.

$$3(HgCl), 2(NH^3HO, SO^2).$$

In circumstances similar to those which give rise to the double sulphites of mercury and potassa and mercury and soda, sulphite of ammonia combines directly with chloride of mercury. The compound is deposited in brilliant pearly scales, which, by boiling, are reduced and give rise to a deposit of chloride of mercury.

The double sulphites may likewise be formed by acting with the alkaline sulphites on oxide of mercury, which enters into solution and eliminates half of the alkaline base.

By boiling in pure water they are reduced, disengage sulphurous acid, and produce immediately sulphate of mercury, which is in its turn destroyed, depositing mercury. Indeed:—

$$2(HgO, SO^2, KO, SO^2)=Hg^2O, SO^3+KO, SO^2+KO, 2(SO^2)=2Hg+2(KO, SO^3)+2SO^2.$$

When a soluble chloride is added to the liquor, reduction does not take place, and I have been enabled to evaporate the solution one-half without its becoming turbid or acid. The chlorides appear to act in this case by their presence alone.

Chloride of mercury also modifies the reaction. When it is in excess, the ebullition causes the partial reduction of the oxide of mercury, and we obtain a crystalline deposit of calomel [reaction 1]. When, on the contrary, the alkaline sulphite is employed in larger proportion, we fall into the preceding case, and the liquor may be boiled without alteration [reaction 2].

1) $2(HgCl)+KO, SO^2+HO=HgCl+KOSO^3+HCl.$

2) $HgCl+2(KO, SO^2)+HO=HgOSO^2, KO, SO^2HO+KCl.$

The alkaline sulphites, put in contact with chloride of mercury, are divided into mercurio alkaline salt, which is dissolved, and into metallic mercury, exactly like the cyanide. In the same conditions the oxysalts of mercury are reduced with disengagement of sulphurous acid.

The iodide of mercury is easily dissolved in the alkaline sulphites, and the mixture gives rise to double salts analogous to those obtained with the chloride.

The sulphites of soda and potassa appear to have no action on the cyanide of mercury. The sulphite of ammonia alone produces, in small quantity, a double salt containing sulphurous acid, and which crystallises mixed with the cyanide of mercury and ammonia, or with the excess of sulphite of ammonia employed.—*Comptes Rendus*, No. 24, June 14, 1852.

CHEMICAL AND COMPARATIVE EXAMINATION OF THE FLUIDS SECRETED BY THE PAROTID AND SUBMAXILLARY GLANDS OF CATTLE.

BY M. J. L. LASSAIGNE.

THE fluids subjected to examination were extracted by M. Collin, principal of the anatomical department of the Ecole Nationale d'Alfort, at the conclusion of numerous experiments which he made on the salivary secretion in several domestic animals.

We profited by this circumstance to study the chemical composition of the fluids ex-

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tracted by M. Bernard's process, by making fistulas in the parotid and submaxillary glands of a cow in good health, sacrificed on purpose for anatomical studies.

Both fluids were obtained clear and limpid as water, and presented a slightly alkaline reaction to test paper; that furnished by the maxillary gland was more viscid and resembled mucus in its consistence. They differ also in density; the fluid secreted by the parotid gland, had at the temperature of 57°F, the density of 1.0108; that of the maxillary gland of the same animal had the density of 1.0065.

The effects produced by the reagents were various, and gave the following results, which we present comparatively.

REAGENTS.	FLUID OF THE PAROTID.	FLUID OF THE MAXILLARY
Distilled water	Nothing	Nothing
Spring water	Slight turbidness	No turbidness
Heat	Remains limpid	Becomes turbid and opalescent
Nitric acid	Slight effervesence without turbidness	Becomes turbid and more viscid
Nitrate of silver	Canary yellow precipitate partially soluble in nitrate of silver	Opaque white magma, and consistent like thick mucus
Subacetate of lead	Floculent white precipitate	Opaque white and half solid magma
Sulphate of iron	Chamois yellowish white precipitate	Very consistent reddish yellow gelatine, magma
Chloride of mercury	Turbidness and sparing white precipitate	Thickened and converted into a transparent glaire
Tannic acid	Nothing	Thickens and renders stringy and mucous
Alcohol at 8 per cent.	Slight turbidness	Glairy and viscid flocks.

FLUID OF THE PAROTID OF THE COW.

Proximate Analysis.

Water	990.74
Mucus and soluble animal matter	0.44
Alkaline carbonate	3.38
Alkaline chloride	2.85
Alkaline phosphate	2.49
Phosphate of lime	0.10
	1000.00

FLUID OF THE MAXILLARY GLAND OF THE COW.

Proximate Analysis

Water	991.14
Mucus	1.73
Soluble animal matter ..	1.80
Alkaline carbonate	0.10
Alkaline chloride	5.02
Alkaline phosphate	0.15
Phosphate of lime	0.06
	1000.00

The alkaline salts mentioned in these two analyses have soda and potassa and soda for base, as indicated by bichloride of platinum and antimoniate of potassa.

FLUID OF THE PAROTID GLAND OF A RAM.

Density 1.0102.

Water	989.00
Mucus and soluble animal matter	1.00
Alkaline carbonate	3.00
Alkaline chloride	6.00
Alkaline phosphate	1.00
Phosphate of lime	traces.
	1000.00

FLUID OF THE PAROTID GLAND OF A HORSE,

Density 1.0045

Water	992.00
Mucus and albumen ..	2.00
Alkaline carbonate ..	1.08
Alkaline chloride	4.92
Alkaline phosphate and phosphate of lime	traces.
	1000.00

Journal de Chimie Médicale, July, 1852.

ON THE CONVERSION OF SALICYLIC ACID INTO MONOCHLORATED BENZOIC ACID.

BY M. L. CHIOZZA.

It is known, from the works of M. Cahours, that by putting protochloride of phosphorus into contact with certain volatile organic acids, with 2 or 3 equivalents of oxygen, we obtain oxy-chloride of phosphorus, hydrochloric acid, and the chlorides of the

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radicls of these acids. This reaction is expressed, for benzoïc acid, by the following equation:

$C^7H^6O^6+PCl^5=C^7H^5O, Cl+ClH+POCP.$

Some experiments undertaken in the laboratory of M. Gerhardt, in the view of obtaining the chloride of salicyle, have demonstrated that the action of the perchloride of phosphorus is not so clear with salicylic acid as with the acids studied by M. Cahours.

Abstraction made of the secondary products of the reaction, it may be formularised in the same manner as for benzoïc acid, with the difference, however, that the product is not immediately divided into hydrochloric acid and into chloride of salicyle, and that this division, being ultimately effected, gives, not chloride of salicyle, but its isomer, monochlorated benzoïc acid.

In submitting to distillation the liquid which was obtained by the action of perchloride of phosphorus on salicylic acid, it is remarked that the temperature rises rapidly; towards the end of the distillation the liquid swells up and leaves as a residue a very light charcoal.

In rectifying the product of this distillation and collecting only that which passes over between 392° F. and 482° F., an oily refracting liquid is obtained, which is possessed of a suffocating odor. This liquid is only slowly decomposed by cold water, but boiling water immediately converts it into hydrochloric acid and monochlorated benzoïc acid.

The difficulty of obtaining the oily body in the pure state has prevented me from analysing it; however, from its mode of decomposition, it may be regarded as a monochlorated hydrochlorate of benzoïc acid, and the formula

$C^7H^5ClO^2, CH$

is attributed to it.

I may here mention that Dr. Stenhouse has already obtained monochlorated benzoïc acid, but mixed with more advanced products of the action of chlorine on benzoïc acid.

In the state of purity, monochlorated benzoïc acid is presented under the form of fine brilliant needles, very similar to those of salicylic acid, from which it is easily distinguished by not being colored with the persalts of iron. It differs likewise in all its properties from its isomer, the chloride of salicyle of M. Piria (hydroguret of chlorosalicyle).

It dissolves very adundantly in boiling water, from which it separates almost entirely by cooling. Its point of fusion is some degrees higher than that of benzoïc acid. It sublimes without decomposition.

Submitted to analysis, it gave results in accordance with the formula

$C^7H^5ClO^2.$

The equivalent of monochlorated benzoïc acid was established by the analysis of the silver salt which contains

$C^7H^5AgClO^2.$

This salt is presented under the form of a crystalline precipitate.

The salt of baryta gave proportions agreeing with the formula

$C^7H^4BaClO^2.$

—*Comptes Rendus*, No. 22, May 31, 1852.

ACTION OF SULPHURETTED HYDROGEN AND SELENIURETTED HYDROGEN ON CHLOROFORM IN THE PRESENCE OF WATER.

BY PROFESSOR LOIR.

SULPHURETTED HYDROGEN.

If a current of washed sulphuretted hydrogen be passed into chloroform placed under water, in a short time an abundant, white, volatile crystalline precipitate is produced possessing a strong smell of garlic; the chloroform disappears completely when the current of gas is passed in for a sufficient length of time, and if care be taken to agitate the liquor powerfully, the abductor tube is very often stopped up. No secondary products are formed. Chloroform saturated with dry sulphuretted hydrogen, placed in a refrigerating mixture, gives only insignificant quantities of a crystalline product, arising, doubtless, from an imperfect dessiccation of the gas and the apparatus; but when water is added, the crystalline body is immediately produced at the ordinary temperature; if it be left to form for several hours, it is then presented in the form of flat quadrangular elongated prisms, whose base is inclined towards the angles. This body is very volatile. When exposed to the cold air, it disappears perceptibly. Placed in a flask, it crystallises in the upper part of the vessel. It is heavier than water and has no action on colored tests. It fuses at the heat of the hand, and may be again solidified in water at a few degrees above zero. It burns more easily than chloroform. It is easily decomposed when dried. Analysis shows that chloroform and sulphuretted hydrogen enter in equal equivalents into this compound.

SELENIURETTED HYDROGEN.

The preparation of the compound obtained with seleniuretted hydrogen is the same as that of the foregoing bodies; its proper-

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ties are analogous. In its formation, its appearance and its reactions, it appears to present the same composition as the foregoing. The author has not yet analysed it.—*Journal de Pharmacie*, June, 1852.

"CHEMICAL REPORT ON THE WATER SUPPLY OF BRISTOL."

BY THORNTON J. HERAPATH, ESQ., ASSISTANT LECTURER ON PRACTICAL CHEMISTRY IN THE BRISTOL SCHOOL OF MEDICINE, &c., &c.

(*Continued from page* 436.)

IV.—RAIN-WATER FROM TANKS AND CISTERNS.

IN consequence of the excessive hardness of most of the well-waters of this neighbourhood, and their inapplicability for the purposes of washing, &c., the tanking, or otherwise storing of rain-water has become a very common practice. Indeed, many of the inhabitants of the poorer districts are entirely dependant on the supply of rain-water, and hence are much distressed in seasons of drought.

I have recently examined several specimens of this description of water from different parts of the city, with the following results:—

Specimen A.

	Grains per Gallon.
Earthy chlorides, with some chloride of ammonium	0·48
Sulphate of ammonia	a little
Sulphates of soda and magnesia	0·40
Sulphate of lime	1·60
Chloride of sodium	0·48
Earthy carbonates	mere traces
Silica	do.
Nitrates of lime and magnesia	0·56
Putrescible organic matter	a little
	3·52

Hardness . . about 2·2 degrees

No alteration in degree occurred on boiling.

Specimen B.

	Contents per Gallon.
Chloride of magnesium	0·311
Chloride of ammonium	0·214
Sulphate of ammonia	a little
Sulphate of lime	2·061
Chloride of sodium	1·054
Earthy carbonates	none
Silica and oxide of iron	0·021
Nitrates of lime and magnesia	1·099
Putrescible organic matter	0·516
	5·276

Hardness . . . undetermined

Specimen C.

Contained 4·75 grains of solid matters per gallon. Its hardness was equal to 3°·1, and its permanent hardness equal to 2°·9.

Specimen D.

	Per Gallon
Solid matters	7·29 grains.
Hardness	4·75 degrees.

*Specimen E.**

	Per Gallon.
Solid matters	1·99 grains.
Hardness	1·5 degrees.

Specimen F.

	Per Gallon.
Solid matters	8·3 grains.
Hardness	6·1 degrees.

V.—RIVER WATER.

I.—River Avon.

The Avon,—so named from the old Celtic *Aman*, or *Amon*, 'a river,' which is pronounced in Irish, *Avan*, and in Welsh, *Avon*,—takes its rise on the northern boundary of Wiltshire, on the millstone grit formation. Thence it flows on, in an easterly direction, to Malmsbury, where its volume is augmented by two large streams, the principal of which derives its source from near Tetbury, in Gloucestershire. Passing onwards to Chippenham, and receiving several tributary brooks by the way, it flows through Bradford—once renowned for its cloth manufactories—towards Bath and Keynsham. Near the latter town it is joined by the river Chew, which as I have before observed, takes its source amongst the mountain limestone districts of the Mendip Hills. From Keynsham, the Avon pursues a winding course of about seven or eight miles to Bristol, whence, after passing through the romantic gorge which separates St. Vincent's Rocks and Leigh Woods, it escapes into the Bristol Channel.

There is no doubt that the course of the Avon formerly was very different from what it now is. Writing in the year 1141, the author of a latin M.S., *Gesta Stephani*, describes the position of the city of Bristol with respect to the river in the following terms (see translation by Mr. Seyer, in his "Memoirs"):—"* * * by the very situation of the place, the best defended of all the cities of England; for (as we read of Brundusium) a certain part of the province of Gloucester, being narrowed

* Collected after long-continued rain.

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into the form of a tongue and extended a long way, forms the city, two rivers washing two of its sides, and meeting together in a great abundance of waters on the lower side, where the land itself is defective (meaning the marsh-ground, which admitted high-tides to the city-wall that extended from the Avon to the Froom, on the N. side of King-Street &c.). Moreover, a quick and strong tide, ebbing and flowing abundantly night and day, causes the rivers on both sides of the city to turn back upon themselves into a wide and deep sea; and, forming a port very fit and safe for a thousand vessels, it binds the circuit of the city so nearly and so closely, that the whole city seems to swim on the water and sit on its banks."

Hence, it is clear, that the waters of this river in former times flowed over a bed, of which the Avon is now but a very contracted channel.

Reference is not now made to a time anterior to that which witnessed the formation of the chasm or gorge at Clifton; as, before that event took place, there is every reason to believe, the Avon took its way through the vale of Ashton, and emptied itself into the sea at Clevedon.

That portion of the river which once divided the city of Bristol into two unequal parts, was, in 1804, converted by act of Parliament into a floating harbour, for the greater convenience of the shipping; a new course being at the same time made for the passage of the river-water by excavating what is now termed "The New Cut," or "New River," through the line of country lying between the eastern boundary of the city and the Red Clift, the seat of the then Dowager Lady Smith. This floating harbour is still in existence, and measures between three and four miles in length. It receives a large share of the sewage of the city, which circumstance accounts for the comparatively large proportion of nitrogenous organic matter contained in the water, as well as the origin of the disagreeable smells which are occasionally emitted by the waters of the float during warm weather.

Below are given the results of my analyses of several specimens of the water of this river, collected at different parts of its course.

Specimen A.

Obtained from Hanham Mills, about five miles from Bristol, in 1846.

This contained about 21 grains of solid matters per gallon.

Specimen B.

Obtained from the same spot, on January 10th, 1852.

Contents per Gallon.	Grs.
Chlorine	2·903
Sulphuric acid	1·234
Carbonic acid combined with the earthy bases	3·685
Nitric acid	traces.
Lime	5·044
Magnesia	0·643
Soda	2·136
Potash	traces
Sesquioxide of iron	traces
Silicic acid	0·710
Organic matter	4·321

Matters held in mechanical suspension, and separable by a filter, 0·401gr.

Composition of the water per gallon:—	
Chloride of calcium	0 401
Chloride of magnesium	0·323
Chloride of sodium	4·005
Chloride of potassium	traces
Sulphate of lime	2·099
Earthy nitrates	traces
Organic matters	4·321
Carbonate of lime	7·104
Carbonate of magnesia	1·067
Carbonate of the protoxide of iron	traces
Silicic acid	0·710
	20·030
Saline residue, as determined by direct experiment	20·104

At the close of the last century a company was formed, which proposed to supply Bristol with water from the Avon, at Hanham; but their project was never carried into execution. According to the agreement which this company entered into with the Corporation, the city was to have been supplied for 200 years, at the rate of about £2 a-year for each family. In 1783, however, the company forfeited £500 to the Corporation and closed their works.

Specimen C.

Obtained from above the Creasote works, near Crew's Hole, about two miles from Bristol, on January 17th, 1852.

Contents of the water per gallon, in grains:—	
Chlorine	3·1699
Sulphuric acid	1·6270
Carbonic acid in combination	3·7184
Nitric acid	traces.
Lime	5·5174
Magnesia	0·6522
Soda	2·1786
Potash	traces.
Oxide of iron	traces.
Silicic acid	0·6400
Organic matter	5·9200

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Matters held in mechanical suspension, and separable by a filter . . 0·321 gr.

Composition of the water per gallon :—

Chloride of calcinm . .	0·536
Chloride of magnesium .	0·499
Chloride of sodium . .	4·085
Chloride of potassium .	traces.
Sulphate of lime . .	2·766
Nitrates of lime or magnesia	traces.
Organic matters . .	5·920
Carbonate of lime . .	7·340
Carbonate of magnesia .	0·933
Carbonate of the protoxide of iron	traces.
Silicic acid	0·640
	22·719
Saline residue, as determined by direct experiment .	22·88

The hardness of the water from this part of the river varies from 10¼ to 12 degrees. The permanent hardness averages about 3 degrees. It is from this spot, I am informed, that the barges which supply the shipping of this port are usually filled.

Specimen D.

Obtained from "the Feeder," near St. Philip's bridge, on January 17th, 1852.

Solid matters per gallon 22·4 grains.
Hardness . . about 12¼ degrees.

Specimen E.

Obtained from the Floating Harbour, on the same day.

Solid matters per gallon, containing 7·01 grains of organic matter . . about 29 grs.
Hardness . . about 13 degrees.

Specimens F. & G.

Obtained from the tidal portion of the river Avon, at Rownham Ferry, Hotwells, on October 6th, 1851.

	Grains per gallon. (Low tide)	(High tide)
Alkaline and earthy chlorides, with some sulphate of soda and sulphate of magnesia and organic matters	98·68	868·4
Earthy carbonates .	8·24	2·6
Sulphate of lime with a little silica, &c. .	4·40	9·01
	111·32	880 01
Solid matters in suspension mud, &c. . .	undeter.	2·4

II.—River Froome.

The sources of the Froome are found near Dodington, in Gloucestershire; from which spot the stream flows on to the S. W. of Sodbury, passing through Iron Acton,—where it is joined by the river Laden,—to Hambrook. At this place it is met by a large stream, called Bradley Brook, which drains the tract of country lying to the westward of Winterbou rne. The two united thence make their way to Stoke, where they are joined by a stream from the Park, and afterwards through Stapleton to Baptist Mills, so called because the religious community of that denomination in early times performed there the ceremony of immersion, from which it derives its name. After passing Baptist Mills, the waters of this river become largely contaminated with sewage matters, and are thus rendered quite unfit for drinking. Indeed, as Sir Henry de la Beche very truly observes in his Report on the Sanatory Condition of Bristol, "* * * "the course of the Froome, after that river "enters amongst the houses of the town, "may be regarded as the chief sewage "nuisance in Bristol. Into it is discharged "a large mass of the filth of the town, and "it may be considered as a great open "sewer until it reaches the Stone Bridge, "where it enters the culvert—a very ingeni- "ous contrivance of flood-gates, allowing "the surplus waters in floods to escape into "the adjoining branch of the floating "harbour."

Subjoined are the results of my analyses of four specimens of this river-water.

Specimen A.

Obtained at Iron Acton, in 1846.

	grains per gal.
Chlorine	12·271
Sulphuric acid . . .	2·813
Carbonic acid (in combination) . .	3·370
Nitric acid . . .	traces.
Lime . . . Magnesia . . .	6·402
Soda	10·575
Potash	traces
Oxide of iron . . .	traces
Silicic acid . . .	traces
Organic matters . .	a little

Composition per gallon :—

	Grains.
Earthy chlorides. . .	3·01
Chloride of sodium . .	18·55
Sulphate of soda . .	1·54
Nitrates and organic matter	a little
Sulphate of lime . .	3·33
Carbonate of lime . .	3·50
Carbonate of magnesia	0·35
Silica	traces
	30·28

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Hardness . . . undetermined

Specimens B. & C.

Obtained from Stapleton.

	Collected on April 28th, 1852.	Collected on May 8th, 1852.
Solid matter per gallon	44·5	47·1
Hardness . . .	20°	21°·25

Specimen D.

Obtained from Baptist Mills, on December 15th, 1851.

	Grains per gallon.
Chlorine	2·880
Sulphuric acid . . .	16·562
Carbonic acid (in combination) . .	8·186
Nitric acid . . .	11·751
Lime	16.723
Magnesia	6·014
Soda	7·353
Potash	3·126
Oxide of iron . . .	a little
Silicic acid . . .	1·600
Organic matter . .	7·928

Composition per gallon:—

	Grains.
Chloride of sodium . .	4·800
Sulphate of potash . .	5·768
Sulphate of soda . .	10·784
Sulphate of lime . .	13·480
Nitrate of magnesia . .	16.103
Organic matter . .	7·928
Carbonate of lime . .	17·640
Carbonate of magnesia .	3·280
Carbonate of the protoxide of iron . .	a little.
Silicic acid	1.600
	81·383
Saline residue, as determined by direct experiment .	81·30

The solid matters from a gallon of the water, when burnt with potash-lime, yielded 0·28 gr. of ammonia.

(The conclusion of this paper is unavoidably postponed until next month.)

INTRODUCTION TO THE STUDY OF CHEMISTRY.

No. X.

VI. HYDROGEN CONTINUED.

HYDROGEN AND CHLORINE. HYDROCHLORIC ACID. MURIATIC ACID. HCl. 37.

HYDROCHLORIC ACID exists naturally in the gaseous state, but the form under which it is commonly known is that of solution in water. It has been long known in chemistry, and was formerly called marine acid, spirit of salt and muriatic acid. Since its composition has been accurately determined, it has received the name of hydrochloric acid, which is the one now in common use.

PREPARATION.—The ordinary mode of preparing it, which originated with Glauber, consists in the decomposition of chloride of sodium (common salt) by means of sulphuric acid: it is produced in large quantity in the manufacture of *soda ash*, which will be fully entered into when we come to speak of *carbonate of soda*.

In the small way, hydrochloric acid may be prepared in the following manner:—

A glass globe, with a wide mouth, is fitted with a cork in which two holes have been made: into one aperture is fixed a glass tube bent in the form of the letter S, with long ends, for the addition of the sulphuric acid; by the other aperture the globe is connected by a glass tube, bent twice at right angles, with a Woulfe's bottle, and this again by means of tubes similarly bent with a series of three-necked Woulfe's bottles. A quantity of common salt is put into the globe, which is placed in a sand bath and the apparatus is adjusted. Each Woulfe's bottle must be half filled with water. Equal weights of sulphuric acid and water are mixed together, and this mixture is added to the common salt in the globe. Hydrochloric acid gas is immediately disengaged, with effervescence, and condenses in the Woulfe's bottles. When pure hydrochloric acid is required, it may generally be obtained by putting commercial hydrochloric acid into a glass retort, the neck of which enters into a globular receiver containing one-fourth part of water to each part of commercial acid in the retort to condense the first portion of gas distilled: the remainder of the acid distilled will be obtained quite pure, and of convenient strength for ordinary use.

As the commercial acid commonly contains arsenic, owing to the sulphuric acid used in its preparation having been made from iron pyrites, and as it is difficult to separate this metal from it, it is preferable to prepare the pure acid directly with sulphuric acid and common salt by the modification of the above process introduced by Gregory, which is as follows: six parts by weight of pure salt, are put into a flask containing ten parts of sulphuric acid and four parts of water; the mixture of acid and water must be first allowed to cool, a long glass tube bent twice at right angles is adjusted to the flask, and one end of it is allowed to touch the surface of six parts of distilled water,

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contained in a bottle surrounded by ice or very cold water. The flask, which is placed in a sand-bath, is now gently heated until gas no longer comes over. About two-thirds of the gas will distil over dry, but the last third is mixed with steam: the receiver should now be changed, when a second quantity of acid, not so strong as the first, of the specific gravity of 1·140 is obtained. If a second charge of sulphuric acid and salt be distilled in the same receiver, the hydrochloric may be obtained in its more concentrated form, of the specific gravity of 1·210. In this process, two atoms of sulphuric acid being employed to one of salt, and only a low temperature being required for the decomposition, and the sulphuric acid being dilute, no chloride of arsenic is formed, and arsenious acid cannot be distilled over.

Hydrochloric acid is produced in several other ways, but it is not necessary to enumerate them here.

Composition.—Hydrochloric acid, in the gaseous or combined state consists of one part by weight or one equivalent of hydrogen and thirty-six parts or one equivalent of chlorine:

	Equivs.	Atoms.	Per cent.
Hydrogen	1 .	= 1	2·7
Chlorine	1 .	= 36	97·3
		37	100·0

The gas was discovered, in 1772, by Priestley. Its specific gravity, compared with air, is 1·262.

The strongest liquid or aqueous acid consists of one atom of real acid and six atoms of water; its specific gravity is 1·210.

Properties.—Hydrochloric acid gas is perfectly unrespirable; it is uninflammable, and extinguishes the flame of a lighted taper immersed in it. When free from moisture, it is colorless and invisible, and exerts no action on vegetable colors: when it contains moisture, it appears in the form of dense white fumes, reddens litmus paper, and restores the color of turmeric which has been turned brown by means of an alkali. It has an irritating action on the skin. It attracts water powerfully. A piece of ice let up into the vapor over mercury is immediately liquefied, and absorbs the gas. Water dissolves from 400 to 500 times its volume of hydrochloric acid gas. When this gas is put in contact with a metallic oxide, both are decomposed, and a chloride and water are produced. Some of the metals also decompose it, taking the chlorine acid and evolving the hydrogen. Potassium does so, and frequently takes fire; but it is sometimes prevented from burning by becoming covered with a coating of chloride of potassium; in this case, the careful application of heat will cause the burning to occur.

When the liquid or aqueous acid is pure, it is colorless; but it is generally yellowish from portions of cork or luting accidentally falling into it. Dr. Thomson supposed that this yellow color might be due to a trace of bromine derived from the salt. Commercial hydrochloric acid almost always contains iron, sulphuric acid, and frequently nitric and sulphurous acids. The iron may be detected by the black tint produced by the addition of tincture of galls, and the sulphuric acid by the formation of a white precipitate on adding chloride of barium. Nitric acid may be detected by boiling some gold-leaf in the acid, and adding a solution of protochloride of tin, which, when, nitric acid is present, gives rise to a purple tint. The addition of a few crystals of protochloride of tin, when sulphurous acid is present, will cause the formation of a brown precipitate of sulphuret of tin. When it contains free chlorine, it decolors solution of indigo. The highly concentrated acid boils at 112° and fuses at—60° F., (Dalton). Chloric, iodic and bromic acids, and some of the peroxides, which contain oxygen in somewhat feeble combination, decompose it. The peroxide of manganese is commonly used to decompose it for the production of chlorine gas.

Metallic zinc rapidly decomposes concentrated hydrochloric acid, forming chloride of zinc and evolving hydrogen. Peroxide of lead disengages chlorine from it.

The strength and atomic composition of aqueous hydrochloric acid of various densities is shown in the following tables compiled by Mr. Edmund Davy and Dr. Thomson.

Temperature 40° F. Barometer 30°

Atom of water to 1 of acid.	Real acid to 100 of liquid.	Specific gravity.
6	40·66	1·203
7	37·00	1·179
8	33·95	1·162
9	31·35	1·149
10	29·13	1·139
11	27·21	1·128
12	25·52	1·119
13	24·03	1·112
14	22·70	1·106
15	21·51	1·100
16	20·44	1·096
17	19·47	1·090
18	18·59	1·086
19	17·79	1·082
20	17·05	1·078

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Specific gravity.	100 grains contain of hydrochloric acid.
1·21	42·43
1·20	40·80
1·19	38·38
1·18	36·36
1·17	34·34
1·16	32·32
1·15	30·30
1·14	28·28
1·13	36·26
1·12	24·24
1·11	22·22
1·10	20·20
1·09	18·18
1·08	16·16
1·07	14·14
1·06	12.12
1·05	10·10
1·04	8·08
1·03	6·06
1.02	4·04
1·01	2·02

Hydrogen and Iodine. Hydriodic Acid.—HI. 127.

Hydrogen forms only this one compound with iodine, which was first examined by Gay-Lussac and Sir H. Davy. At ordinary temperatures it exists as a colorless gas, which may be best produced in the following way:—Put some iodine and pieces of phosphorus together at the bottom of a glass tube, cover the mixture with powdered glass, and heat gently: iodide of phosphorus is thus produced; add a little water, which percolates through the pulverised glass, and acts with violence on the iodide of phosphorus, which is decomposed, forming oxide of phosphorus and hydriodic acid. A smaller tube bent at each end is now adapted, to the tube containing the mixture, by means of a cork; the hydriodic acid gas passes through this tube and may be collected. Hydriodic acid gas may likewise be obtained by passing a mixture of hydrogen and the vapor of iodine through a tube heated to redness. Millon's process consists in heating a mixture consisting of one part of phosphorus, fourteen of iodide of potassium, twenty of iodine and a small quantity of water. D'Arcet states that hydriodic gas may be obtained of great purity by evaporating hydrophosphorous acid until just about evolving phosphuretted hydrogen gas, and then putting it, with its own weight of iodine, into a small tube retort, and applying a gentle heat, the gas is then liberated, 100 grains of hydrophosphorous acid and 100 of iodine yielded to him 120 cubic inches of hydriodic acid gas.

However produced, the gas received over mercury must be transferred as speedily as possible to an exhausted vessel, or it will soon undergo decomposition.

The simplest process of obtaining aqueous hydriodic acid is to pass a stream of sulphuretted hydrogen into water, in which iodine is diffused. The iodine combines with the hydrogen, the sulphur being liberated. When all the iodine has disappeared, the liquid should be well boiled, in order to drive off the excess of sulphuretted hydrogen, and filtered. The liquid hydriodic acid is evaporated to sp. gr. 1·700; it is then in its most concentrated state, and may be distilled without undergoing alteration. It may also be procured by treating iodide of barium with dilute sulphuric acid.

Hydriodic acid gas is colorless and sour, it gives out fumes in the air and resembles hydrochloric acid in odor. It reddens vegetable blues. Its specific gravity compared with hydrogen is 63·5, and compared with air, 4·4024. It is uninflammable and extinguishes flame. It may be liquefied under pressure, and becomes solid and transparent at −60° F. When passed through a red hot percelain tube it is decomposed into hydrogen and iodine. Water absorbs it in considerable quantity. The saturated solution boils at 200° F., and may be distilled; on exposure to a temperature below 260° F., it becomes concentrated by loss of water. When kept in the air, it is partially decomposed, and acquires a dark color. Chlorine and nitric and sulphuric acids decompose it. When mixed with oxygen and passed through a tube heated to redness, it is formed into iodine and water. Chlorine decomposes it, forming hydrochloric acid, sometimes with explosion. Hydriodic acid dissolves iodine.

The composition of the gaseous acid is:—

Hydrogen	. 1	=	1	0·8
Iodine	. 1	=	126	99·2
			127	100·0

Hydrogen and Bromine. Hydrobromic Acid.—HBr. 79.

This acid, in the gaseous and aqueous states, is formed by the same processes as hydriodic acid, bromine being substituted for iodine; but it cannot be obtained by the direct action of its elements on each other.

Hydrobromic acid gas is colorless and sour, and gives dense fumes when mixed with damp air. Its odor is very pungent and irritating. It is not decomposed by being passed with oxygen or iodine through a tube heated to redness: chlorine decomposes it, eliminating bromine and forming hydrochloric acid. In most of its reactions it resembles hydrochloric acid.

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100 cubic inches of hydrobromic acid gas weigh 85·06 grains. This gas is composed of

Hydrogen	. 1	= 1	1·266
Bromine	. 1	= 78	98·734
		79	100·000

Hydrobromic acid gas is readily absorbed by water, with evolution of heat; the liquid acid is formed, which gives off fumes, and, when pure, is colorless; it readily dissolves bromine, assuming a yellow color. The specific gravity of the most concentrated acid is 1·20. It boils below 212° F., giving off the gaseous acid. Chlorine instantly decomposes it. Nitric acid decomposes it, producing nitrous acid and water, and liberating bromine.

HYDROGEN AND FLUORINE. HYDROFLUORIC ACID.—HF. 20.

Hydrofluoric acid was discovered by Scheele. It is prepared by distilling pulverised fluor spar with twice its weight of concentrated sulphuric acid, in a leaden retort, and is collected in a leaden receiver surrounded by ice. In performing this operation, care must be taken not to allow any of the acid to touch the hand, as it causes a very troublesome sore. This acid has a very suffocating oder.

Hydrofluoric acid, which is anhydrous when thus prepared is very volatile; it boils at 60° F. It is heavier than the water, and when diluted to a certain extent, becomes still more so. The more oxidisable metals are quickly dissolved in it, forming metallic fluorides, and hydrogen is evolved. Gold, silver, platinum and lead are the only metals on which it does not act. There must be no solder about the leaden vessels in which it is kept.

When pure, this acid is colorless and very volatile, and it fumes in the air. Its specific gravity is 1·0609. It has a greater attraction than sulphuric acid for water: when dropped into water, a hissing noise is occasioned.

Its most remarkable property is that of acting upon glass; in this action, much heat and effervescence are produced, and dense fumes, consisting of fluo-silicic acid are evolved. It is used for etching on glass. This operation is performed in two ways:—1, by means of the liquid acid; 2, by means of the vapor.

In the first mode, the glass is covered with an uniform coating of wax, and the design is traced on it with a graver or the point of a needle, care being taken to penetrate with the instrument to the surface of the glass; the glass to be etched is now subjected to the action of the acid, which must vary in strength according to the depth of etching desired.

In the second mode, the glass is prepared in the same way as the first. A mixture of fluor spar and sulphuric acid is placed on a flat leaden basin, and the glass is laid upon it, the waxed side downwards; the basin is slightly heated; the hydrofluoric acid rises in vapor and acts on the surface of the glass laid bare by the graver: it decomposes the silica, forming fluoride of silicium: this fluoride of silicium is soon decomposed by the aqueous vapor, and a quantity of silica is reproduced, giving to the surface a white and rough appearance.

Hydrofluoric acid is composed of:—

	Atoms		Equivs.	Per cent.
Hydrogen	1	=	1	5·07
Fluorine	1		19	94·93
			20	100·00

ON THE OCCURRENCE OF CAPRIC AND CAPRYLIC ACIDS IN SOME FOUSEL OILS.

BY THOMAS H. ROWNEY, F.C.S., ASSISTANT IN DR. ANDERSON'S LABORATORY, EDINBURGH.

IN a paper read before the Royal Society of Edinburgh and published in their Transactions, I pointed out that capric acid could be obtained from the fousel oil procured from some of the Scotch distilleries. At the same time, I mentioned that another acid was present but in such small quantity that its constitution could not be ascertained.

The capric acid was found in the residue obtained after distilling off the amylic alcohol, and in that portion of the residue having the highest boiling point, viz., above 240° C. A subsequent examination of the portion boiling between 190° C. and 220° C., enabled me to obtain a sufficient quantity of the second acid to determine its composition.

The oily residue was boiled with a strong solution of caustic posassa; dilute sulphuric acid was added to the cold alkaline solution; and the oil which rose to the surface was filtered off and washed with cold water; it was then dissolved in a solution of ammonia and precipitated by chloride of barium, and this precipitate was collected on a filter and washed with cold water. The baryta-salt was dissolved in boiling water, filtered, and allowed to crystallize; the crystals obtained were caprate of baryta. This salt was separated by filtering, and the mother-liquor was concentrated by evaporation on a water-bath.

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When reduced to about one-third of its bulk, it was allowed to cool, when it deposited an abundant crop of crystals; the mother liquor from these crystals gave another crop by being again concentrated. The baryta-salt was purified by re-crystallization, and an analysis made of it. The baryta was determined as carbonate, by ignition in a platinum crucible, the salt burning very readily:

I.

·2872 grms. of substance, dried at 100° C., gave
·1340 „ „ carbonate of baryta.

II.

·3300 grms. of substance gave
·1535 „ „ carbonate of baryta.

III.

·2930 grms. of substance gave
·1360 „ „ carbonate of baryta.

IV.

·2705 grms. of substance, dried at 100° C., and burnt with chromate of lead, gave
·4487 „ „ carbonic acid, and
.1772 „ „ water.

V.

·2973 grms. of substance, gave
·4940 „ „ carbonic acid, and
·1988 „ „ water.

	I.	II.	III.	Mean.
Ba O	36·24	36·12	36·04	36·13.

	IV.	V.	Mean.
Carbon	45·24	45·31	45.28
Hydrogen	7·28	7·42	7·35

The numbers obtained, correspond with those for caprylate of baryta, as will be seen by comparing the theoretical numbers with those obtained by experiment.

			Mean of experiment.
C_{16}	96	45·37	45·28
H_{15}	15	7.09	7·35
O_3	24	11·34	11·24
BaO	76·6	36·20	36·13
	211·6	100·00	100·00

This examination shows, that, in addition to the usual constituents of fousel-oil, viz., water, alcohol and amylic alcohol, the fousel-oil obtained from some of the Scotch distilleries, contains compounds having a higher boiling point than amylic alcohol, and that capric and caprylic acids are present in these compounds, but whether as amyl or ethyl compounds could not be ascertained, as no fixed boiling point could be obtained on distillation. —*Quarterly Journal of the Chemical Society*, April, 1852.

II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

THE NEW PATENT LAW AMENDMENT ACT.

July, 1852.

WHEREAS it is expedient to amend the law concerning letters patent for inventions, Be it enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

I. The Lord Chancellor, the Master of the Rolls, her Majesty's Attorney-general for England, her Majesty's Solicitor-general for England, the Lord Advocate, her Majesty's Solicitor-general for Scotland, her Majesty's Attorney-general for Ireland, and her Majesty's Solicitor-general for Ireland, for the time being respectively, together with such other person or persons as may be from time to time appointed by her Majesty, as hereinafter mentioned, shall be Commissioners of patents for inventions; and it shall be lawful for her Majesty from time to time, by warrant under her royal sign manual, to appoint such other person or persons as she may think fit to be a Commissioner or Commissioners as aforesaid; and every person so appointed shall continue such commissioner during her Majesty's pleasure; and all the powers hereby vested in the Commissioners may be exercised by any three or more of them, the Lord Chancellor or Master of the Rolls being one.

II. It shall be lawful for the Commissioners to cause a seal to be made for the purpose of this Act, and from time to time to vary such seal, and to cause to be sealed therewith all the warrants for letters patent under this Act, and all instruments and copies proceeding from the office of the Commissioners, and all courts, judges, and other persons whomsoever, shall take notice of such seal, and receive impressions thereof in evidence, in like manner as impressions of the Great Seal are received in evidence, and shall also take notice of and receive in

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evidence, without further proof or production of the originals, all copies or extracts certified under the seal of the said office, of or from documents deposited in such office.

III. It shall be lawful for the Commissioners from time to time to make such rules and regulations (not inconsistent with the provisions of this Act) respecting the business of their office, and all matters and things which under the provisions herein contained are to be under their control and direction, as may appear to them necessary and expedient for the purposes of this Act; and all such rules shall be laid before both Houses of Parliament within fourteen days after the making thereof, if Parliament be sitting, and if Parliament be not sitting, then within fourteen days after the next meeting of Parliament; and the Commissioners shall cause a report to be laid annually before Parliament of all the proceedings under and in pursuance of this Act.

IV. It shall be lawful for the Commissioners of her Majesty's Treasury to provide and appoint from time to time proper places or buildings for an office or offices for the purposes of this Act.

V. It shall be lawful for the Commissioners, with the consent of the Commissioners of the Treasury, from time to time to appoint for the purposes of this Act such clerks and officers as the Commissioners may think proper; and it shall be lawful for the Commissioners from time to time to remove any of the Clerks and officers so appointed.

VI. Every petition for the grant of letters patent for an invention, and the declaration required to accompany such petition, shall be left at the office of the Commissioners, and there shall be left therewith a statement in writing, hereinafter called the provisional specification, signed by or on behalf of the applicant for letters patent, describing the nature of the said invention; and the day of the delivery of every such petition, declaration, and provisional specification shall be recorded at the said office, and endorsed on such petition, declaration, and provisional specification, and a certificate thereof given to such applicant or his agent; and all such petitions, declarations, and provisional specifications shall be preserved in such manner as the Commissioners may direct, and a registry thereof and of all proceedings thereon kept at the office of the Commissioners.

VII. Every application for letters patent made under this Act shall be referred by the Commissioners, according to such regulations as they may think fit to make, to one of the law officers.

VIII. The provisional specification shall be referred to the law officer, who shall be at liberty to call to his aid such scientific or other person as he may think fit, and to cause to be paid to such person by the applicant such remuneration as the law officer shall appoint; and if such law officer be satisfied that the provisional specification describes the nature of the invention, he shall allow the same, and give a certificate of his allowance, and such certificate shall be filed in the office of the Commissioners, and thereupon the invention therein referred to may, during the term of six months from the date of the application for letters patent for the said invention, be used and published without prejudice to any letters patent to be granted for the same, and such protection from the consequences of use and publication is hereinafter referred to as provisional protection: provided always that in case the title of the invention or the provisioinal specification be too large or insufficient, it shall be lawful for the law officer to whom the same is referred to allow or require the same to be amended.

IX. The applicant for letters patent for an invention, instead of leaving with the petition and declaration a provisional specification as aforesaid, may, if he think fit, file with the said petition and declaration an instrument in writing under his hand and seal (hereinafter called a complete specification), particularly describing and ascertaining the nature of the said invention, and in what manner the same is to be performed, which complete specification shall be mentioned in such declaration, and the day of the delivery of every such petition, declaration, and complete specification shall be recorded at the office of the Commissioners, and endorsed on such petition, declaration, and specification, and a certificate thereof given to such applicant or his agent, and thereupon, subject and without prejudice to the provisions hereinafter contained, the invention shall be protected under this Act for the term of six months from the date of the application, and the applicant shall have during such term of six months the like powers, rights, and privileges as might have been conferred upon him by letters patent for such invention, issued under this Act, and duly sealed as of the day of the date of such application; and during the continuance of such powers, rights and privileges under this provision, such invention may be used and published without prejudice to any letters patent to be granted for the same; and where letters patent are granted in respect of such invention, then in lieu of a condition for making void such letters patent in case such invention be not described and ascertained by a subsequent

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specification, such letters patent shall be conditioned to become void if such complete specification, filed as aforesaid, does not particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed; and a copy of every such complete specification shall be open to the inspection of the public, as hereinafter provided from the time of depositing the same, subject to such regulation as the commissioners may make.

X. In case of any application for letters patent for any invention, and the obtaining upon such application of provisional protection for such invention, or of protection for the same, by reason of the deposit of a complete specification as aforesaid in fraud of the true and first inventor, any letters patent granted to the true and first inventor of such invention shall not be invalidated by reason of such application, or of such provisional or other protection as aforesaid, or of any use or publication of the invention subsequent to such application, and before the expiration of the term of such provisional or other protection.

XI. When any invention is provisionally protected under this Act, or protected by reason of the deposit of such complete specification as aforesaid, the Commissioners shall cause such provisional protection or such other protection as aforesaid to be advertised in such manner as they may see fit.

XII. The applicant for letters patent, so soon as he may think fit after the invention shall have been provisionally protected under this Act, or when a complete specification has been deposited with his petition and declaration, then so soon as he may think fit after such deposit, may give notice at the office of the Commissioners of his intention of proceeding with his application for letters patent for the said invention, and thereupon the said Commissioners shall cause his said application to be advertised in such manner as they may see fit; and any persons having an interest in opposing the grant of letters patent for the said invention shall be at liberty to leave particulars in writing of their objections to the said application at such place, and within such time, and subject to such regulations as the Commissioners may direct.

XIII. So soon as the time for the delivery of such objections shall have expired, the provisional specification, or complete specification (as the case may be), and particulars of objection (if any) shall be referred to the law-officer to whom the application has been referred.

XIV. It shall be lawful for the law-officer to whom any application for such letters patent is referred, if he sees fit, by certificate under his hand, to order by or to whom the costs of any hearing or inquiry upon any objection, or otherwise in relation to the grant of such letters patent, or in relation to the provisional (or other) protection acquired by the applicant under this Act, shall be paid, and in what manner and by whom such costs are to be ascertained; and if any costs so ordered to be paid be not paid within four days after the amount thereof shall be so ascertained, it shall be lawful for such law-officer to make an order for the payment of the same, and every such order may be made a rule of one of Her Majesty's superior courts at Westminster or Dublin, and may be recorded in the books of council and session in Scotland to the effect that execution may pass there in common form.

XV. It shall be lawful for such law-officer, after such hearing, if any, as he may think fit, to cause a warrant to be made for the sealing of letters patent for the said invention and such warrant shall be sealed with the seal of the Commissioners, and shall set forth the tenor and effect of the letters patent thereby authorised to be granted, and such law-officer shall direct the insertion in such letters patent of all such restrictions, conditions, and provisoes as he may deem usual and expedient in such grants, or necessary in pursuance of the provisions of this Act, and the said warrant shall be the warrant for the making and sealing of letters patent uuder this Act according to the tenor of the said warrant; provided always that the Lord Chancellor shall and may have, and exercise such powers, authority, and discretion in respect to the said warrant, and the letters patent therein directed to be made under this Act, as he now has and might now exercise with respect to the warrant for the issue under the Great Seal of letters patent for any invention, and with respect to the making and issuing of such letters patent; and the writ of *scire facias* shall lie for the repeal of any letters patent issued under this Act, in the like cases as the same would lie for the repeal of letters patent which may now be issued under the Great Seal.

XVI. Provided also, That nothing herein contained shall extend to abridge or affect the prerogative of the Crown in relation to the granting or witholding the grant of any letters patent; and it shall be lawful for Her Majesty, by warrant under Her Royal sign manual, to direct such law-officer to withold such warrant as aforesaid, or that any letters patent for the issuing whereof he may have issued a warrant as aforesaid shall

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not issue, or to direct the insertion in any letters patent to be issued in manner herein provided of any restrictions, conditions, or provisions which Her Majesty may think fit in addition to or in substitution for any restictions, conditions, or provisoes which would otherwise be inserted therein under this Act; and it shall also be lawful for Her Majesty, by like warrant, to direct any complete specification which may have been filed under the provision herein before contained, and in respect of the invention described in which no letters patent may have been granted, to be cancelled, and thereupon the protection obtained by the filing of such complete specification shall cease.

XVII. All letters patent for inventions granted under the provisions hereinbefore contained shall be made subject to the condition that the same shall be void, and that the powers and privileges thereby granted shall cease and determine, at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three and seven years respectively, the sum or sums of money and stamp duties in the schedule to this Act annexed; and the payment of the said sums of money and stamp duties respectively shall be endorsed on the warrant for the said letters patent; and such officer of the Commissioners as may be appointed for this purpose shall issue under the seal of the Commissioners a certificate of such payment, and shall indorse a receipt for the same on any letters patent issued under the authority of the said warrant; and such certificate, duly stamped, shall be evidence of the payment of the several sums respectively.

XVIII. The Commissioners, so soon after the sealing of the said warrant as required by the applicant for the letters patent, shall cause to be prepared letters patent for the invention, according to the tenor of the said warrant, and it shall be lawful for the Lord Chancellor to cause such letters patent to be sealed with the Great Seal of the United Kingdom, and such letters patent so sealed shall extend to the whole of the United Kingdom of Great Britain and Ireland, the Channel Islands, and the Isle of Man: and in case such warrant so direct such letters patent shall be made applicable to Her Majesty's colonies and plantations abroad, or such of them as may be mentioned in such warrant; and such letters patent shall be valid and effectual as to the whole of such United Kingdom, and the said islands and isle, and the said colonies or plantations, or such of them as aforesaid, and shall confer the like powers, rights, and privileges as might, in case this Act had not been passed, have been conferred by several letters patent of the like purport and effect passed under the Great Seal of the United Kingdom, under the seal appointed to be used instead of the Great Seal of Scotland, and under the Great Seal of Ireland respectively, and made applicable to England, the dominion of Wales, the town of Berwick-upon-Tweed, the Channel Islands, the Isle of Man, and the said Colonies and plantations, or such of them as aforesaid, to Scotland and to Ireland respectively, save as herein otherwise provided: provided always that nothing in this Act contained shall be deemed or taken to give any effect or operation to any letters patent to be granted under the authority of this Act in any colony in which such or the like letters patent would be invalid by the law in force in the same colony for the time being: provided always, that a transcipt of such letters shall, so soon after the sealing of the same, and in such manner as the Commissioners shall direct, be transmitted to the Director of Chancery in Scotland, and be recorded in the records of Chancery in Scotland, upon payment of such fees as the Commissioners shall appoint, in the same manner and to the same effect in all respects as letters patent passing under the seal appointed by the Treaty of Union to be used in place of the Great Seal of Scotland have heretofore been recorded, and extracts from the said records shall be furnished to all parties requiring the same, on payment of such fees as the Commissioners shall direct, and shall be received in evidence in all courts of Scotland to the like effect as the letters patent themselves.

XIX. Provided always, that no letters patent, save as hereinafter mentioned in the case of letters patent destroyed or lost, shall issue on any warrant granted as aforesaid, unless application be made to seal such letters patent within three months after the date of the said warrant.

XX. Provided, also that no letters patent (save letters patent issued in lieu of others destroyed or lost) shall be issued, or be of any force or effect, unless the same be granted during the continuance of the provisional protection under this Act, or, when a complete specification has been deposited under this Act, then unless such letters patent be granted during the continuance of the protection conferred under this Act by reason of such deposit, save that where the application to seal such letters patent has been made during the continuance of such provisional or other protection as aforesaid,

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and the sealing of such letters patent has been delayed by reason of a caveat or an application to the Lord Chancellor against or in relation to the sealing of such letters patent, then such letters patent may be sealed at such time as the Lord Chancellor shall direct.

XXI. Provided also, that where the applicant for such letters patent dies during the continuance of the provisional protection, or the protection by reason of the deposit of a complete specification (as the case may be), such letters patent may be granted to the executors or administrators of such applicant during the continuance of such provisional or other protection, or at any time within three months after the death of such applicant, notwithstanding the expiration of the term of such provisional or other protection, and the letters patent so granted shall be of the like force and effect as if they had been granted to such applicant during the continuance of such provisional or other protection.

XXII. Provided also, that in case any such letters patent shall be destroyed or lost, other letters patent of the like tenor and effect, and sealed and dated as of the same day, may, subject to such regulations as the Commissioners may direct, be issued under the authority of the warrant in pursuance of which the original letters patent were issued.

XXIII. It shall be lawful (the Act of the eighteenth year of King Henry the Sixth, chapter one, or any other Act, to the contrary notwithstanding) to cause any letters patent to be issued in pursuance of this Act to be sealed and bear date as of the day of the application of the same, and in case of such letters patent for any invention provisionally registered under the "Protection of Inventions Act, 1851," as of the day of such provisional registration, or, where the law officer to whom the application was referred, or the Lord Chancellor, thinks fit and directs, any such letters patent as aforesaid may be sealed and bear date as of the day of the sealing of such letters patent, or of any other day between the day of such application or provisional registration and the day of such sealing.

XXIV. Any letters patent issued under this Act sealed and bearing date as of any day prior to the day of the actual sealing thereof shall be of the same force and validity as if they had been sealed on the day as of which the same are expressed to be sealed and bear date: provided always that save where such letters patent are granted for any invention, in respect whereof a complete specification has been deposited upon the application for the same under this Act, no proceeding at law or in equity shall be had upon such letters patent in respect of any infringement committed before the same were actually granted.

XXV. Where, upon any application made after the passing of this Act, letters patent are granted in the United Kingdom for or in respect of any invention first invented in any foreign country, or by the subject of any foreign power or state, and a patent or like privilege for the monopoly or exclusive use or exercise of such invention in any foreign country is there obtained before the grant of such letters patent in the United Kingdom, all rights and privileges under such letters patent shall (notwithstanding any term in such letters patent limited) cease and be void immediately upon the expiration or other determination of the term during which the patent or like privilege obtained in such foreign country shall continue in force, or where more than one such patent or like privilege is obtained abroad, immediately upon the expiration or determination of the term which shall first expire to be determined of such several patents or like privileges: provided always, that no letters patent for or in respect of any invention for which any such patent or like privilege as aforesaid shall have been obtained in any foreign country, and which shall be granted in the said United Kingdom after the expiration of the term for which such patent or privilege was granted or was in force, shall be of any validity.

XXVI. No letters patent for any invention (granted under the passing of this Act) shall extend to prevent the use of such invention in any foreign ship or vessel, or for the navigation of any foreign ship or vessel, which may be in any port of Her Majesty's dominions, or in any of the waters within the jurisdiction of any of Her Majesty's courts, where such invention is not so used for the manufacture of any goods or commodities to be vended within or exported from Her Majesty's dominions: provided always, that this enactment shall not extend to the ships or vessels of any foreign state of which the laws authorise subjects of such foreign states having patents or like privileges for the exclusive use or exercise of inventions within its territories, to prevent or interfere with the use of such inventions in British ships or vessels, or in or about the navigation of British ships or vessels, while in the ports of such foreign state, or in the waters within the jurisdiction of its courts, were such inventions are not so used for the manufacture of goods or commodities to be vended within or exported from the territories of such foreign state.

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XXVII. All letters patent to be granted under this Act (save only letters patent granted after the filing of a complete specification) shall require the specification there under to be filed in the High Court of Chancery, instead of requiring the same to be enrolled, and no enrollment shall be requisite.

(To be concluded in our next.)

ON THE VARIATION IN THE RELATIVE PROPORTION OF POTASSA AND SODA PRESENT IN CERTAIN SAMPLES OF BARLEY GROWN IN PLOTS OF GROUND ARTIFICIALLY IMPREGNATED WITH ONE OR OTHER OF THESE ALKALIES.

BY CHARLES DAUBENY, M.D., F.R.S., PRESIDENT OF THE CHEMICAL SOCIETY OF LONDON.

ALTHOUGH the necessity for a due supply of earthy and alkaline matters to the growing vegetable may be at present regarded as indisputable, a good deal still remains to be done before we can pretend to lay down, with any degree of certainty, the extent to which any one of those ingredients, commonly present in a particular plant, may be replaced by others, without affecting its health or development.

Saussure, indeed, had long ago ascertained, that a tree varied in its mineral constitution according to the nature of the soil in which it had grown; a fir, for instance, taken from felspathic rock, being found by him to contain much potash, but no magnesia; whilst the same from a dolomitic rock was charged with magnesia, but exhibited a proportionate deficiency in alkali. Berthier, also, had afterwards confirmed this inference by his analysis of two samples of oak timber, the one obtained from Norway, the other from Allevard, in Dauphiny, as the proportion of soda and of potash was found by him greater in the former instance than in the latter.

The independent results of these trustworthy chemists, Liebig has endeavoured to bring under the operation of a general law, which he has himself suggested, in showing that the sum of the oxygen present in all the samples of timber analyzed, whether by Saussure or by Berthier, was uniformly the same, however much in relative amount the bases themselves might vary. This remarkable observation would certainly seem to favour the idea that provided there be bases present in the soil sufficient for neutralizing the organic or mineral acids generated or secreted by the growing vegetable, the nature of the former was comparatively unimportant; and thus might lead us to conjecture, that isomorphous bodies, at least, which replace each other in the structure of a mineral, might do the same also in the organization of a plant.

Amongst other facts tending to the same conclusion, may be cited the analyses made some years ago by Will and Fresenius, of barley grown in the interior of Germany, and in the more maritime districts of the Netherlands, as the former was found to contain a smaller proportion of soda in comparison with the potash present, than the latter.

But before we allow ourselves to push our inferences beyond the point to which the above facts strictly warrant us in proceeding, let us consider, for a moment, the arguments that may be adduced on the opposite side, as tending to show, that a certain definite mineral composition is to be ascribed to each particular plant, and probably even to every one of the several organs of which it is made up. If the nature of the mineral ingredients present in a plant were a matter of indifference, provided only the neutralizing power possessed by them were sufficient for the purpose of enabling them to combine with the acids present; or even if, without proceeding to this extent, we suppose one alkali capable in general of supplying the place of another, or an alkaline earth of being substituted for an alkali, what then is the end of that remarkable power of selection which all plants possess, and which is so remarkably evinced by those of marine origin, in their assimilation, not only of iodine, but also of potash, from a sea containing both in infinitesimal proportions only. The case of the Algæ, indeed, is only an extreme example of a generally pervading law; for it is sufficient to cast a glance over any series of vegetable analyses, as, for instance, the tabular view given by Dr. Karl Bischof in a late number of the "Journal für praktische Chemie," of the composition of various plants, to be convinced, that they in general absorb potash in preference to, and even to the exclusion of, soda, without reference to the comparative abundance of the two alkalies in the soil.

Dr. Bischof shows, that out of a series of 200 ash analyses of land plants, or of particular portions of them, there are more than $\frac{5}{6}$ths in which the proportion of potash was estimated to exceed that of soda, and more than $\frac{1}{2}$th in which potash alone was found, these latter analyses moreover being the most recent, and probably, therefore, the most trustworthy. On the other hand, there is not a single plant known in which

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soda alone occurs, and only a few, excepting those belonging to the class of marine algæ, in which its amount exceeds that of potash. Bischof also assigns reasons for supposing that the proportion of soda in the ashes may often have been over-estimated. It seems, moreover, difficult to understand, why, if soda can take the place of potash, and lime or magnesia of either, the same should not be the case with strontia; and yet I found several years ago, that when a plant had been watered with a solution containing that earth, so minute a trace of it was found in its ashes, that it became impossible to suppose the principle in question to have entered into the composition of its tissue. Lastly, with reference to the results obtained by Will and Fresenius, I may be permitted perhaps to set against them, some made a few years ago in my own laboratory, which tended to show, that barley possessed the same mineral composition, so far as its alkalies were concerned, whether it had been grown in the east or west coast of England, or in the more central district of Oxfordshire.

Deeming, therefore, the subject to be one open to further investigation, I was induced last summer to institute a few experiments; the results of which I will next submit, as introductory to a statement of certain views respecting the mode in which the two alkalies come to be formed in the ashes of a plant, and the functions severally discharged by them in their living organisation, which I am desirous of laying before this Society.

For the purpose of ascertaining how far the alkaline constitution of a crop of barley might be modified by a difference in the quality of the soil in which it was grown, I selected in the same part of the Oxford Botanic Garden, seven plots of ground, of equal size, and as nearly as possible similar in point of quality, exposure, &c. Two of these plots were manured with a pretty strong dressing of subcarbonate of potash; two with an equivalent amount of subcarbonate of soda; two with common salt, in quantity sufficient to supply the same proportion of soda as the last; whilst the seventh was left without any application at all. The size of the plots was such, that the quantity of potash added would be eqivalent to about ten bushels of common salt to the acre, and to corresponding quantities of carbonate of soda, and of carbonate of potash to the same surface of soil.

The quantities being respectively:

20 lbs. of subcarbonate of soda in crystals,
7 ,, of pearl-ash,
9 ,, of common salt to each plot,

these numbers representing equivalent amounts of the two alkalies.

In order to prevent these saline matters from being too speedily washed away by rain, I had previously dissolved them in water, and had mixed each of the several solutions with a bulk of stiff clay large enough to absorb the whole of the liquid. The mixture was then exposed to the sun and air, in order that the salts might become dry, and be thoroughly incorporated with the mass; after which the whole was thrown upon the plots intended for their reception, and mixed up intimately with the soil down to the depth of two feet from its surface.

An equal amount of barley was then sown in each of the said plots, and the crop obtained separately dried and weighed, the straw and grain having been kept distinct. A portion of each having been incinerated, the soluble portion of the ash was taken up by water, after which everything, except the alkaline salts, was removed by the methods usually employed for that purpose. An aliquot portion of the alkaline residuum was in each case converted into chloride, and the potash separated from the soda-salt by means of the chloride of platinum.

The difference between the amount of produce, in the bed left unmanured, and in the rest, sufficiently attests the benefit that had been derived from every one of the saline matters added, and that nearly in an equal ratio from each of them; whilst the larger amount of soda present in the crops which had been dressed with carbonate of soda and with chloride of sodium, might seem to indicate, that this alkaline principle had, to a certain extent, taken the place of the potash, in consequence of its being present in the soil in a larger proportion here than in the other plots.

But a little further consideration may perhaps suggest a different mode of explaining the facts in question. It must be recollected in the first place, that the roots of plants suck up indiscriminately from the soil every kind of matter presented to them, whether it be poisonous to them or nutritious, as was long ago ascertained to be the case by Saussure.

There, must, therefore be circulating through the system of a plant, during all the stages of its growth, a certain amount of every species of saline matter which happens to lie in contact with its roots, of which, although only that which is capable of being assimilated by its organs actually constitutes a part of its substance, the remainder is nevertheless detained within the vegetable tissue for a certain time, and can-

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not be separated from it by any known mechanical process.

When therefore we dry a plant, and reduce it to ashes, its residuum after incineration will contain not only the alkaline matter which actually entered into the composition of the organs themselves, but likewise that circulating at the time through its tissue. The former indeed, may be assumed to bear a constant relation to the volatilizable ingredients associated with it, but the latter will necessarily vary according to the nature of the saline impregnation belonging to the water which bathes its roots.

Thus, from the soil to which nothing had been added, a certain amount of soda as well as of potash would seem to have been extracted by the barley grown in it, since both alkalis made their appearance in the portions incinerated. This, however, is easily explained, inasmuch as, by a previous analysis, both soda and potash had been found to exists as original constituents of the soil. It is probable, however, that a good deal of the estimated quantity of each did not actually enter into the constitution of the organs, but had been merely arrested in its progress through the plant, so as to be present in it at the moment when the crop was cut down.

The following results were obtained:

PLOTS:	yielded:			
Manured with:	altogether.	of:	in 100 parts of the alkaline residuum.	
			Potash	Soda
Carbonate of potash ..	average of the two crops 71½ lbs.	viz. grain 13½ lbs.	84.50	15.50
		straw 58 „	79.50	20.50
Carbonate of soda ..	„ „ 71 „	viz. grain 13½ „	76.50	23.50
		straw 57½ „	72.75	27.25
Chloride of sodium ..	„ „ 78 „	viz. grain 14½ „	76.50	23.50
		straw 63¾ „	76.50	23.50
Unmanured.	produce of the bed . . 63 „	viz. grain 11 „	82.50	17.50
		straw 52 „	79.50	20.50

From the addition of carbonate of potash to the soil, only a small increase to the per centage of potash in the plant itself appears to have resulted; but it must be recollected, that the quantity of potash present in the ground was distributed over a greater amount of crop, as the produce of the bed rose, in consequence of this addition, from 63 to 71½ lbs.

By the dressing of carbonate of soda given to the third set of beds, the per centage of soda was augmented in a still higher ratio, because the increase of crop which followed did not in the same degree augment the consumption of soda by the plant, as this alkali enters less abundantly into its actual organisation. A larger proportion of it, therefore, would remain in the juices circulating through the vegetable tissue, and would therefore add to the apparent amount of soda in the crop when examined.

The same explanation may apply to the increase of the same alkali which took place in the crop that had been manured with common salt; this, however, would appear to exist in the plant as common salt, since, judging from the results of the analyses given in my Bakerian Lecture, the salt in question enters, as such, into the tissue of a plant without undergoing decomposition.

I may perhaps elucidate my meaning by the following hypothetical statement, in which the numbers given must be understood to be quite arbitrary, and intended merely for the purpose of illustration.

Confining ourselves to the grain of the barley experimented upon, let us assume the normal quantity of potash and soda present in it to stand to each other in the relation of 74 of the former to 9 of the latter.

The above explanation may perhaps be open to objection; but I conceive it to be at least encumbered with fewer difficulties than would attend the notion of an actual substitution of soda for potash taking place within the organism of a plant; for in that case we must suppose, that although a certain number of the atoms of the one alkali may be replaced by the other, no such change can take place with regard to the greater part of those present; for were the latter possible, that is, were the whole, or the greater part of the atoms of potash capable of being replaced by soda, not only would there have been a much greater

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difference in the constitution of barley grown in soils so largely impregnated, as mine were, with salts of soda, in comparision with the same charged with those of potash; but we should also be at a loss to explain the absence of a larger proportion of soda-salts in those samples of barley which I had obtained from the neighbourhood of the sea, than existed in others taken from inland situations.

Then, in the unmanured crop;

Normal quantity being . .	Potash	74.0	Soda	9.0
There will have been circulating through the crop when cut	,,	8.5	,,	8.5 or 50 to 50.
		82.5		17.5

In crops manured with carbonate of potash:

Normal quantity	Potash	74.0	Soda	9.0
Circulating through the crop	,,	10.5	,,	6.5 or 67 to 33.
		84.5		15.5

In the crops manured with carbonate of soda and chloride of sodium:

Normal quantity	Potash	74.0	Soda	9.0
Circulating through the crop	,,	2.5	,,	14.5 or 15 to 85.
		76.5		23.5

In the experiments above detailed, the utmost increase of soda in the crop caused by so liberal an application of soda-salts to the soil, did not exceed 8 per cent of the whole; or in other words, if we adopt the hypothesis of substitution, only 1 atom in 12 of the potash actually present admitted of being replaced by soda: nor does it appear, that the largest disproportion between the quantity of the two alkalies brought into contact with the plant can materially affect this limitation; for otherwise, marine algæ, which are nourished by a fluid in which the potash stands in the smallest possible relation to the soda, could scarcely contain so large an amount of potash as is frequently found to exist in them. And yet, although we must, in adopting this hypothesis, assume certain limits to exist, beyond which the usual constitution of a plant does not admit of change even by the most liberal supply of soda, a large excess of this latter alkali must be supposed necessary, in order that it should replace the potash in any degree at all; inasmuch as we find no extraordinary amount of the mineral alkali in barley grown near the sea, where soda-salts must be more abundant than they are inland.

These considerations would lead me to imagine, that even in marine plants, a portion of that large quantity of soda, which is detected in their ashes, may be derived from the juices circulating through their cellular structure, and does not enter into their actual organisation; so that even in them, perhaps, potash may turn out to be the alkali which plays the principal part in building up the living fabric of the plant. I am by no means inclined, however, to limit the uses of the alkaline matter which is constantly contained in the sap, to the one end of supplying a plant with the potash and soda, which it requires, for the formation of its different organs, and for that of its characteristic secretions; since Liebig himself has pointed out another function which both alkalies are equally fitted to discharge, namely, the fixation of carbonic acid, through which, owing to the consequent diminution of oxygen, sundry other organic acids, such as the tartaric, the oxalic, the melic, &c. may be formed.

It is not my intention, however, to pursue this fertile subject on the present occasion; in conclusion, therefore, I will only remark, that I am fully aware of the scantiness of the data contributed by myself in this paper towards the elucidation of the question discussed in it, and that I should have been reluctant to occupy the time of this Society by bringing them forward, had I not hoped that they might be the means of stimulating others of our members, who have more leisure than myself, for such investigations, to undertake a larger and more precise train of experiments, calculated to determine the still questionable point, as to the power residing in plants to substitute one mineral ingredient for another, in the construction of their respective organs, or in the elaboration of the peculiar secretions which they contain.—*Quarterly Journal of the Chemical Society*, April, 1852.

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ON BLISTERING CERATE.

BY EUGENE DUPUY, PARMACEUTIST, NEW YORK.

The successful researches of Robiquet in his labors on the Cantharis Vesicatoria, have demonstrated that the crystallisable neutral substance to which he gave the name of *Cantharidine*, is the proximate epispatic principle of the blistering cerate on which the physician depends in most cases, where an extended and yet deep revulsive action is necessary, whether it is derived from the cantharis vesicatoria or from other members of the trachelid family.

The experiments of Mess. Lavini & Sobrero of Turin, have confirmed the supposition made by analogy, of the indentity which exists in the vesicating principle of all these coleopters, and there is a strong presumption that our commerce will soon be enriched with the beautiful cantharis, (C. nutalli,) abounding in the midst of our rising South Western States, and that it will eventually supersede the cantharis vesicatoria we obtain from abroad. If adulteration would not destroy, by its baneful influence, the advantageous form of complex extracts, we could obtain a desirable amelioration of our officinal cerate, by substituting for the powdered cantharides an equivalent proportion of the oleaginous liquid, with which they are saturated in the fresh state, and which is possessed of all the vesicating properties of the insect. That liquid is prepared in various parts of the Sardinian kingdom, especially at Verceil, where it is extensively used by veterinary surgeons in preference to the prepartions from the powdered insect, it producing deeper revulsion.

It is also used, diluted in bland oleaginous substances for stimulating the activity of feeble serous exudations. As for the present we have not generally access to that natural product of the cantharis, we must select those insects in the best possible conditions, and endeavour to fix their active principle in such a manner as will diminish the liability to spontaneous volatilisation of which it is susceptible, even at ordinary temperature.

I have been for many years in the habit of preparing a blistering plaster which, I think, has some advantages over our officinal cerate, because it fixes the volatilisable principle, and at the same time rather increases than diminishes its energy.

To the officinal plastic mixture in which the powdered cantharides have been gradually incorporated, I add about 5 per cent of a mixture containing equal parts of strong acetic acid (prepared by distillation of the acetates of copper or lead), and pulverised camphor. The acetic acid tranforms the cantharidine into an acetate of the same which is not volatilized at ordinary temperatures, and the camphor diminishes the symptoms of strangury which some patients have to endure when the application of a blistering plaster is resorted to. I also usually spread the blister on adhesive plaster on account of the convenient adhesion of that material.—*New York Journal of Pharmacy*, March, 1852.

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SUMMARY OF THE EXPERIMENTS MADE BY THE

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Nos. of Experiments.	Medium of the Roots, consisting of 58 grammes of	Silica.	Potassa.	Soda.	Carbonate of soda.	Chloride of potassa.	Nitrate of potassa.	Nitrate of soda.	Nitrate of ammonia.	Chloride of potassium.	Chloride of sodium.	Carbonate of lime.	Phosphate of lime.	Sulphate of lime.
XLVI	Rock crystal heated to redness and washed	0,035	0,018	..	0,001	..	..	..	0,038	0,001	..	0,1	0,03	0,(
XLVII	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	..	..	0,1	0,03	0,(
XLVIII	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	0,001	..	0,1	0,03	0,(
XLIX	Id.....	0,017	0,009	..	..	..	..	..	0,02	0,001	..	0,1	0,03	0,(
L	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	0,001	..	0,1	0,03	0,(
LI	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	0,001	..	0,1	0,03	0,(
LII	Rock crystal not heated to redness.....	0,017	0,009	..	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LIII	Id.....	0,017	0,009	0,0013	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LIV	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	0,001	..	0,1	0,03	0,(
LV	Id.....	0,017	0,009	..	..	..	..	..	0,02	0,001	..	0,1	0,03	0,(
LVI	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	0,001	..	0,1	0,03	0,(
LVII	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LVIII	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LIX	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LX	Not heated.....	0,017	0,009	..	..	..	..	0,005	0,02	..	..	0,1	0,03	0,(
LXI	Id.....	0,017	0,009	..	..	..	..	..	0,02	0,001	..	0,1	0,03	0,(
LXII	Id.....	0,017	0,009	..	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LXIII	Heated to redness...	0,035	0,909	0,002	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LXIV	Not heated	0,017	0,009	..	..	..	..	..	0,02	0,001	..	0,1	0,03	0,(
LXV	Heated to redness..	0,017	0,009	0,004	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LXVI	Id.....	6,017	0,009	0,002	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LXVII	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LXVIII	Id.....	0,017	0,009	0,002	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LXIX	Id.....	0,017	0,009	..	..	..	..	0,05	0,02	..	0,001	0,1	0,03	0,(
LXX	Id..	0,017	0,009	..	..	..	..	0,003	0,02	..	0,001	0,1	0,03	0,(
LXXI	Not heated.....	0,017	0,009	..	..	0,001	..	..	0,02	..	..	0,1	0,03	0,(
LXXII	Heated to redness...	..	0,009	..	..	..	..	0,005	..	..	..	0,1	0,03	0,(
LXXIII	Id.....	..	0,009	..	..	..	0,002	0,004	..	..	0,001	0,1	0,03	0,(
LXXIV	Id.....	..	0,009	..	..	..	0,002	0,008	..	..	0,001	0,1	0,03	0,(
LXXV	Id.....	..	0,009	..	..	..	0,002	0,005	..	..	..	0,1	0,03	0,(
LXXVI	Washed sand.....	0,017	0,009	0,002	..	..	0,002	..	0,02	..	..	0,1	0,03	0,(
LXXVII	Sand fused with sulphate of potassa and washed.	0,017	0,009	0,002	..	..	..	..	0,03	..	..	0,1	0,03	0,(
LXXVIII	Rock crystal heated to redness	0,017	0,009	..	..	..	..	..	0,02	..	..	0,1	0,02	0,(
LXXIX	Id.....	0,017	0,006	..	..	..	..	0,005	0,02	..	..	..	0,03	0,(
LXXX	Id.....	0,017	0,009	..	..	0,002	..	..	0,02	..	..	0,2	0,03	0,(
LXXXI	Id.....	0,017	0,009	0,001	..	0,002	..	..	0,09	..	..	0,1	0,03	0,(
LXXXII	Id.....	0,017	0,009	..	..	0,004	..	..	0,02	..	..	0,1	0,03	0,(
LXXXIII	Id.....	0,017	0,009	0,001	..	0,004	..	..	0,02	..	..	0,1	0,03	0,(
LXXXIV	Sugar charcoal....	0,017	0,009	..	..	..	..	..	0,02	..	..	0,1	0,03	0,(
LXXXV	Rock crystal	0,017	0,009	..	..	..	0,02	0,06	..	..	..	0,1	0,04	0,(

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SALM HORTSMAR ON THE VEGETATION OF OATS.

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Native ferriferous oxide of iron.	Phosphate of iron.	Carbonate of manganese.	Phosphate of alumina.	Hydrate of alumina.	Titaniferous hydrate of alumina.	Silicate of potass and alumina.	Silicates of potass, soda and alumina.	Titanate of potass.	Fish glue.	Washed beech-ashes.	Length of the stems in centimetres.	Color of the leaves.	Flowers.	Fruits.	Lateral Shoots.
..	..	0,001	..	..	..	..	..	..	..	..	15	Pale yellow	4 incomplete.	..	1
..	..	0,001	0,001	..	..	..	..	..	..	..	26	Green	6	..	1
..	..	..	0,001	..	..	..	..	..	..	..	8	Yellow	..	..	2
..	..	0,001	0,001	..	..	..	..	..	..	..	28	Green	8	..	2
..	..	0,001	0,001	..	..	..	..	..	..	..	25	Green	8	..	3
..	..	0,001	0,001	..	..	..	..	0,0005	..	..	23	Green	9 incomplete.	..	2
..	..	0,001	0,001	..	..	..	..	..	..	..	18	Green	4	..	2
..	..	0,001	..	..	..	0,07	..	..	0,01	..	16	Green	3	..	1
..	..	0,001	..	..	..	..	..	..	..	..	28	Green	8	..	3
..	..	0,001	..	..	..	..	0,13	..	..	..	30	Green	9	..	2
..	..	0,001	..	..	..	0,13	..	..	..	..	16	Green	3	..	1
0,4	..	0,001	..	..	..	0,07	..	..	..	..	28	Green	8	..	2
..	..	0,001	..	0,06	..	..	..	..	..	..	24	Green	6	6	commence.
..	..	..	..	0,06	..	..	..	..	..	..	18	Green	6	4	2
..	..	0,001	..	..	1,9	..	..	..	..	..	15	Green	4	..	2
0,4	..	..	..	..	..	0,07	..	..	..	..	16	Green	4	..	2
..	..	..	..	0045	..	..	..	..	..	..	11	Green	3	..	1
0,4	..	0,001	..	..	..	..	..	..	..	..	18	Green	4	..	2
0,4	..	..	..	..	..	..	..	..	..	..	11	Green	3	..	1
..	0,002	0,001	..	..	..	..	..	..	..	..	29	Green	6	..	1
..	..	0,001	..	..	..	..	..	..	..	..	33	Green	8	..	1
..	..	..	..	..	..	..	..	..	..	..	13	Pale green	4 incomplete	..	commence.
..	0,05	0,001	..	..	..	..	..	..	..	..	15	Green	4	4	Commencement.
..	..	..	..	..	..	..	..	..	..	..	15	Green	6	..	2
..	..	0,001	..	0,03	..	..	..	..	..	..	15	Pale green	3 incomplete	..	1
..	..	0,001	..	0,03	..	..	..	..	..	..	12	Green	3	..	2
..	..	0,001	..	..	..	..	..	..	..	..	20	Green	8	1	1
..	..	0,001	..	..	..	..	..	..	..	..	18	Green	4	..	1
..	..	0,001	..	0,06	..	..	..	..	..	..	17	Green	3	2	..
..	..	..	..	0,06	..	..	..	..	..	..	4	Green	..	..	2
..	..	..	..	..	..	..	..	..	..	..	20	Green	9	..	3
..	..	..	..	..	..	..	..	..	..	..	15	Green	1	1	..
..	..	..	..	..	..	..	..	..	..	0,4	8	Sickly	..	..	..
..	..	0,001	..	..	..	..	..	..	..	..	19	Green	3	3	..
..	0,03	..	..	..	..	..	..	..	..	..	13	Green	5	..	1
..	..	..	..	..	..	..	..	..	..	..	17	Green	3	..	1
..	..	0,001	..	..	..	..	..	..	..	..	19	Green	4 incomplete	..	..
..	..	0,001	..	..	..	..	..	..	..	..	2	Green	..	..	2
..	..	0,005	..	..	..	..	..	..	..	..	19	Green	..	..	..
..	0,05	0,001	..	..	..	..	..	..	..	..	..	..	..	..	2
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

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ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.*

Improved chemical combination of certain agents for obtaining a new plastic product. ALCIDE MARCELIN DUTHOIT, of Paris, statuary. Patent dated January 12, 1852.

This invention consists in combining with gutta percha previously prepared for the purpose, oxide of zinc, purified or otherwise, fusible spar (sulphate of barytes), and amianthus, in combination with various colors, thus producing a new plastic composition. The gutta percha is to be prepared and bleached by dissolving it in rectified naphtha, or benzole, or sulphuret of carbon, or other solvent, and is then mixed with the other ingredients in the following proportions:

First Composition. One part of gutta percha, and one part of oxide of zinc.

Second Composition. Equal parts of gutta percha and fusible spar [sulphate of barytes].

Third Composition. Equal parts of gutta percha and amianthus in the state of powder, or dissolved in rectified naphtha or benzole. When the compounds do not possess sufficient elasticity, caoutchouc dissolved in naphtha, or bezole, may be added to them.

In compounding the mixtures above-mentioned, the patentee operates as follows:—He first dissolves the gutta percha in the naphtha, and then, after filtration, places the solution in a still, and adds the oxide of zinc, fusible spar, or amianthus, together with the colour to be employed, and stirs the whole well together. The still is then heated by a balneum mariæ, steam, sand, or other means, and the heat maintained until the volatile liquid used is driven off. The composition is then removed and moulded into the articles which it is desired to produce. Instead of introducing the coloring matter in the still, it may be mixed with the composition by masticating in warm water, rendered alkaline by the solution therein of crystals of soda.

The compositions produced as above are suitable for making models, tissues, moulded articles of various kinds, artificial flowers, and, when rolled into sheets, may be used as a substitute for leather, and applied to all the purposes for which leather is used. They may also be diluted with naphtha or benzole to any desired consistence, and applied as liquid paints.

Claim.—The production of a new composition or plastic product susceptible of receiving any required color or shade of color, and the application of the same to manufacturing purposes, as described.

Improvements in obtaining and drawing off aërated and other liquids, and in charging vessels with gaseous fluids, applicable to vessels for holding solids matters, and also as a fastening for utensils and apparatus, and in holders for cigars. THOMAS MASTERS, of Regent-street, confectioner. Patent dated December 11, 1851.

1. The improvements specified under this patent consist in a mode of stoppering or closing bottles for containing aërated liquids, and also jars for holding solids, by the employment of a ring of mineralised India-rubber attached to a stopper, and acted on by a screw and nut forming part of the same, so as to be compressed into a groove or recess formed inside of the neck of the bottle or jar, and thus produce an air-tight joint. Another improvement in stoppers consists in covering the same with mineralised India-rubber, which, being compressed when the stopper is introduced into a bottle or jar, produces a tight joint.

2. The patentee describes sundry improvements in apparatus for aërating liquids and for drawing off aërated liquids; also in taps for general purposes, which consist principally of various modes of applying elastic materials in constructing the same.

3. The improvements consist of a mode of preventing the entrance of water into jelly and other moulds for confectionary purposes by applying a band of mineralised India-rubber, which is slipped on and allowed to contract over the joint formed by the meeting of the cover with the bottom of the moulds.

4. The patentee describes an elastic fastening for keeping the brushes of knife-cleaning machines in contact with each other.

5. The "improvements in holders for cigars" consist in forming mouth-pieces to be used with the same from mineralised India-rubber which is stated to be preferable to the vulcanised India-rubber for this purpose, inasmuch as it is destitute both of the unpleasant taste and smell which distinguish the latter.

Improvements in the treatment of certain substances for the production of manures. (Being a communication.) JOHN GEDGE, of Wellington-Street Strand. Patent dated December 16, 1851.

This invention consists in the production

*Collected from *The Mechanic's Magazine.*

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of manures by treating stable-dung alone or mixed with straw, leaves, or vegetable matters with a solution of certain chemical substances. The solution is composed by dissolving in eleven gallons of water 1 lb. of the following mixture of ingredients; the proportions of which however may be varied:—

	lbs.	oz.
Sulphate of ammonia ..	8	12
Sulphate of potassa....	16	10
Sulphate of soda	19	10
Sulphate of alumina ...	25	—
Sulphate (qy. of what?).	25	—
Sulphuric acid	5	—
	100	

Seventy-seven gallons of the solution will be sufficient for treating one ton of dung. The mixture may be applied in the open air, but it is preferred to perform the operation in the stable, as there is then less chance of the ammonia volatilizing. And in order to secure as large a portion of this ingredient to the lower strata of litter and dung, the floor of the stable should be made to retain the urine of the animals, instead of allowing it to run to waste. The stable-dung thus prepared is laid as a foundation for a manure heap to the depth of about 12 inches, over as large a surface as the heap is intended to cover; a layer of straw and vegetable matter to the depth of 3 or 4 feet is then piled on; then another of stable-dung, and so on till the heap is completed. As soon as fermentation takes place the manure is ready for use. The vegetable matters may be used in their green state or dry, in which case they should be well saturated with water. The chemical substances above named may be used in their dry state alone, or mixed with earth as a manure.

Claims.—1. The making of manure heaps, commonly called "dung-hills," as described, using the chemical combination set forth for that purpose.

2. The combination of chemical substances described, to be used alone, or mixed with earth or other pulverized matter.

For certain alloys and combinations of metals. JOHN DAVIE MORRIS STIRLING, of Black Grange, North Britain, Esq. Patent dated December 22, 1851.

In the specification of a former patent, dated January 31st, 1851, the patentee described a method of coating iron with tin, after having been previously coated with zinc. The first of the present improvements consists in previously depositing on the iron a coating of copper (which may be done by immersion in a solution of a salt of copper), and then coating with zinc to receive the tin, which is applied in a melted state.

Another improvement consists in coating iron so covered with copper with a coating of tin; and a third improvement consists in using zinc, instead of tin, as a covering for iron coated with copper. The patentee prefers the use of a saline instead of an acid solution for cleansing the surface of the metal previous to immersing in the melted zinc or tin, and he uses a solution of sal-ammoniac for this purpose. He also rolls the iron coated with copper before applying a covering of another metal, but regulates the pressure so as not to cause brittleness.

Another improvement consists in combining with hardened lead a covering of tin, or alloy of tin, so as to produce a metal suitable for use as a substitute for Queen's metal, Britannia metal, British silver, or pewter. For this purpose the patentee takes a slab of hardened lead, which he rolls to any required thickness and quite smooth; he then places a sheet of tin or alloy thereof on the surface of the lead, and passes them through the rolls, using at first a pressure just sufficient to bring them into close contact, and applying what is technically called "a severe pinch," so as to complete the union of the metals. The compound sheet may then be rolled to any required thickness. For the purpose of hardening the lead used as above, the patentee prepares an alloy of equal parts of tin and zinc melted together, and adds five parts thereof to every ninety-five parts of lead, stirring the metals well to produce perfect incorporation of the alloy. Or the hardening may be effected by the use of antimony in the proportion of from one part in fifteen to one part in nine of the lead. Or arsenic may be used with the lead for the same purpose, in the proportion of from one to two parts per cent.

Another improvement consists in coating zinc with lead, or the ductile alloys of lead, by pressure. Lead, hardened as first described, may be also used.

Another improvement is the combining of zinc or tin, or the ductile alloys of either of these metals with cadmium. The metals are rolled into sheets, and passed through the rolls in contact with each other, by which their union is effected.

Another improvement consists in coating copper and its ductile alloys with tin or the ductile alloys of that metal. This is also effected by pressure.

Another improvement consists in applying a coating of silver to tin, Britannia metal and other ductile alloys of tin by pressure; and in employing gold or platinum in like manner as a coating by combining the same

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with tin or the ductile alloys thereof. And here the patentee remarks with regard to the use of pressure for combining metals together, that the harder the metals are, the greater care is requisite in passing them through the rolls. In all cases the surfaces of the metals to be united should be perfectly smooth and clean.

Another mode of coating the more fusible metals, such as zinc, tin, or alloys thereof, with silver or platinum, consists in employing the process of casting the more fusible metals on to the less fusible, and subsequently using pressure to bring the slabs to sheets of any required thickness.

Another improvement consists in soldering, or otherwise uniting by heat, German silver to copper and its alloys, and then extending the mass into sheets by rolling.

The last branch of the invention has relation to the manufacture of iron. The first of the improvements here specified consists in adding chromium to iron, in order to improve its quality. The chromium is used in the ore, that is as chrome iron, or chromate of iron, in the proportion of from $\frac{1}{800}$ to $\frac{1}{400}$th part of each puddling charge. It may be added, however, at an earlier stage of manufacture. When the iron is cold or red-short, the patentee adds from 1lb. to 3lbs. of a chloride (by preference chloride of sodium). The chromium is added to the iron when nearly or quite melted, in proportions which vary with the character of the metal operated on, soft iron requiring more than that which is of a harder nature. The chloride may be added at the same time, or when the metal is beginning to boil, and before coming to nature.

Another of the improvements consists in adding baryta, or its salts or compound, to iron. For this purpose the carbonate of baryta is preferred, which is used in the same manner as chromium, in the proportion of about 1lb. to every puddling charge.

Another improvement is the addition to iron of carbonate of lime and muriate of soda. These materials are mixed together in about equal parts, and two or three pounds of the mixture are introduced into the iron when in a melted state.

Another improvement consists in using an alloy of tin with arsenic, or of lead with arsenic, as coating for iron. The alloy being applied to the iron when hot, in the same manner as soldering or tinning is performed. The latter of these combinations will be found serviceable for shipbuilding purposes, and other similar uses. The iron may be previously coated with copper.

The last improvement consists in applying lead, or lead ore in the manufacture of iron in blast furnaces; also in combining with lead, lead ore or oxide of lead for such uses, chlorides, by preference chloride of sodium (common salt). The lead is added when charging the blast furnace in the proportion of 1 lb. to 2 lbs. to the charge, and the chloride (when used) is introduced at the same time, in the proportion of 15 lbs. to 25 lbs. to the charge. The iron thus made is free from impurities, and will be found very suitable for making wrought iron.

Improvements in coating and ornamenting zinc. (A communication.) FRANCIS HASTINGS GREENSTREET, of Albany-Street, Mornington-Crescent. Patent dated December 31, 1851.

These improvements consist in coating and ornamenting zinc or zinced surfaces by means of acids, alone or combined with other matters capable of acting chemically on the surfaces. The solutions used may be applied by sprinkling, dabbing, spreading or marbling; and the surfaces coated are capable of further ornamentation by painting, which may be done with common oil colors. Among the preparations which the patentee recommends for coating and ornamenting zinc or zinced surfaces, are the following:

1. Muriatic acid diluted with water to a strength of about 1·114. The coating produced by this solution is of a light ash-color.

2. Chrome yellow, ground fine with soft water, and mixed with preparation 1 to a liquid consistence. This gives a yellowish grey color.

3. The pigment known as "mountain or Saxony green," mixed gradually with preparation 1 to a thin paste, and stirred till effervescence ceases. This produces an iron grey colour tinged with green.

4. White lead, ground fine with soft water, and mixed with preparation 1, produces a grey coating. Where expense is not an object, Kremnitz white may be used instead of the white lead.

5. Flour of sulphur ground fine with water and mixed with preparation 1. This mixture gives a yellowish white coating.

6. Butter of antimony may be mixed with the before-mentioned preparations. When used alone it produces a black color, but when mixed, does not affect the color of the preparation with which it is used. It produces a good ground for subsequent painting or other application.

7. Butter of antimony diluted with distilled water. This produces a fine coating, resembling in color Indian ink.

8. Butter of antimony mixed with spirits

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of turpentine. This preparation when applied alone, produces a black color; it may have pigments of different kinds mixed with it, and the effect will then vary according to the nature of the color employed.

The surfaces after having been coated by the means above mentioned, and further ornamented, if thought desirable, should be protected by a coating of varnish. Copal varnish may be used for this purpose; but the patentee recommends the use of wax, or mixture containing wax, as this substance is an effectual preservative against oxidation, and easily renewed or kept in good condition.

In conclusion, the patentee wishes it to be understood that he makes no claim to the use of nitrate or muriate of copper which have been known and employed for printing on zinc, but he claims.

The modes described of coating and ornamenting zinc and zinced surfaces by compounds acting chemically on the surfaces.

Improvements in the treatment of copper minerals. (A communication.) ANTONIO DE SOLA, of Madrid. Patent dated December 24, 1851.

This invention consist of a new process from separating copper from its ores by the employment of voltaic electricity.

The ores are first calcined (with the addition of sulphur in case there is not a sufficient quantity present) to bring them to the state of sulphate, which is dissolved in water, and the copper separated from the solution by a voltaic battery composed of alternate plates of copper and iron or lead immersed therein, and excited by the usual acid solutions. In order to facilitate the separation of the copper, heat may be applied to the vessel containing the liquid and battery.

Claims.—1. The employment of a volatic battery to separate the copper from the ores.

2. The preparation of the mineral ores, to render them fit for this mode of operating.

3. A particular arrangement of basins or receivers for the precipitation of the metal.

4. The arrangement of the voltaic battery in a heated chamber or receiver, in order to increase the power of the apparatus, and for hastening the operation.

A new manufacture of manure. FREDERICK BOUSFIELD, of Devonshire-place, Islington, gentleman. Patent dated December 19, 1851.

This invention consists in manufacturing manure from blood. The patentee takes the blood of cattle, sheep and pigs from the slaughterhouses, and having separated the fibrine by stirring, he places the blood in evaporating pans, and applies heat until it is reduced to a thick consistence. The heat should vary between 120° and 165° Fahr., and should not be raised to the boiling point, as some of the constituents of the blood are by so great a heat rendered insoluble, and deprived of their valuable properties. When the consistence of the blood is such as to admit of its being removed from the evaporating pans, it is spread on shelves or on the floor of a room to dry, and currents of heated air are caused to pass over it to facilitate this operation, care being taken to stir it, in order to prevent the formation of lumps, and cause it to dry in a powdery state. Or it may be subjected to pressure before being placed on the shelves to dry, and immediately after its removal from the evaporaters. The powder thus obtained is applied to agricultural purposes, in the same manner and proportions as guano and such like manures. The extent of dryness given to the blood to convert it to manure may be varied, but the patentee recommends that the processes of evaporating should be carried on until the blood loses in weight about 65 to 75 per cent.

Claims.—The manufacture of manure from blood in the manner described.

Improvements in separating substances of different specific gravities. (A communication.) ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. Patent dated December 24, 1851.

The machinery or apparatus which constitutes the subject of this patent is adapted specially for the separation of copper from the gangue in which it is contained, and consist mainly of a curved pan, to which a rocking motion is given similar to that imparted to a shovel in the operation of "vanning." The pan is suspended at its rear end by two long pendulous rods, and at its front by two short rods inclining upwards and backwards to the point of suspension of the rear, and motion is given to the pan by cranks. A stream of water is also employed for carrying off the lighter particles through holes pierced at the rear end of the pan, while the copper or other separated substance is delivered over the front of the pan.

Claims.—1. Giving to the reciprocating pan the peculiar motion described.

2. Giving the back movement to the pan in a less time than the forward movement, by means of a crank or cranks whose axis

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of motion is below the plane of motion of the rear end of the pan.

3. The employment, in combination with a pan having the motion described, of a current or currents of water descending the curved or inclined surface of the pan.

4. Making the rear end of the pan with an incline or curve upwards.

5. Making the pan with apertures behind the place where the substances to be separated are supplied.

6. Making the front and rear ends of the pan (having the motion described) with a gradual curve downwards when the same is employed in combination with currents of water.

Improvements in apparatus used when obtaining instantaneous light. RODOLPHE HELBRONNER, of Regent-st. Patent dated December 19, 1851.

1. For the purpose of obtaining instantaneous light, whether for lighting lamps, or cigars and other similar uses, the patentee prepares strips of cotton wadding rolled together, or fibrous materials similarly rolled and cemented on the outside with paste, gutta percha, or other material with which has been mixed saltpetre, or any suitable acetate, nitrate, or chromate. These strips he dots or spots with phosphoric mixture at intervals apart, corresponding to the length of time they are required to burn. He then places a strip so prepared in a tube or case which has a slot or opening down the side, and a traveller or slide for protruding the strip of material from the case when required to be ignited. When a flame is desired to be produced, the strip of material is coated with stearine, wax, or other combustible material before applying the phosphoric mixture.

2. For the purpose of applying the phosphoric mixture, a frame is prepared composed of a number of splints or slips of wood of a bellying form at the middle of their length, held together by transverse stays. This frame is dipped into the mixture, and a number of lengths of material having been laid together, the mixture is deposited on them at distances apart, corresponding to the intervals between the slips by applying the frame transversely to the collection of lengths of prepared material.

Claims.—1. The causing of the material to be attached to a travelling slide in a tube or case, and causing the material to ignite as explained. Also, the peculiar manner of spotting or depositing the phosphoric mixture at intervals, so as to obtain continued light.

2. The arrangement described of placing the lengths of material. Also, the form and use of the instruments for depositing the phosphoric mixture upon the materials prepared to receive them.

Improvements in treating fatty and oily matters, and in the manufacture of lamps, candles, night-lamps, and soap. GEORGE GWYNNE, Esq., of Hyde Park Square, and GEORGE FERGUSSON WILSON, managing director of Price's Patent Candle Company, Vauxhall. Patent dated December 31, 1851.

Claims.—1. The employment of heat above 360° in the acidification of fatty matters when such acidification is not performed in the still.

2. The distillation in an atmosphere of steam, or other suitable gaseous body, of acidified matters which have, after the acidification, been treated with lime or some substituted agent.

3. A mode of adding fatty matters to the lime in the process of saponification, instead of adding the lime to these matters.

4. The use of sulphurous acids for separating the fatty acids from soaps, and also for separating bases from the fatty acids.

5. The use of sulphurous acid when combined with another acid, for separating the fatty acids from soaps.

6. The treating of fatty acids with sulphurous acid, and also with ammonia and sulphurous acid, combined or free.

7. The use of sulphurous acid, or some substituted agent, for the purification of such fatty matters as have been previously acted on by nitrous fumes and the use of lime water, or some substituted agent, when followed by the use of an acid for the same purpose.

8. The use of atmospheric air, or some substituted agent, for operating on such fatty matters as have been previously acted on by nitrous fumes.

9. Agitating fatty matters by atmospheric air, whether its oxygen be combined or free.

10. The use of atmospheric air for acting on such fatty matters as have been acted on by chemical agents.

11. The use of sulphurous acid obtained by combustion, as a substitute for other acids, for operating on fatty matters.

12. The distillation of soap in an atmosphere of steam.

13. The use of the lamp described for burning rosin oil, which has been distilled in an atmosphere of steam. This lamp combines the principles of the "Fountain" and "Camphine" lamps, and embodies the arrangements of the former for the supply of oil, and of the latter for preventing the emission of smoke.

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III. PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

ACT FOR REGULATING THE QUALIFICATIONS OF PHARMACEUTICAL CHEMISTS.

WHEREAS it is expedient for the safety of the public that persons, excercising the business or calling of Pharmaceutical Chemists in Great Britain, should possess a competent practical knowledge of Pharmaceutical and general Chemistry and other branches of useful knowledge: And whereas certain persons, desirous of advancing Chemistry and Pharmacy, and of promoting an uniform system of educating those who should practise the same, formed themselves into a Society, called "The Pharmaceutical Society of Great Britain," which said Society was on the 18th day of February, 1843, incorporated by royal charter, whereby it was provided that the said Society should consist of Members who should be Chemists and Druggists, who were or had been established on their own account at the date of the said charter or who should have been examined in such manner as the Council of the said Society should deem proper, or who should have been certified to be duly qualified for admission, or who should be persons elected as superintendants by the Council of the said Society: And whereas it is expedient to prevent ignorant and incompetent persons from assuming the title of or pretending to be Pharmaceutical Chemists or Pharmaceutists in Great Britain, or Members of the said Pharmaceutical Society, and to that end it is desirable that all persons before assuming such title should be duly examined as to their skill and knowledge by competent persons, and that a register should be kept by some legally authorized officer of all such persons: And whereas for the purposes aforesaid, and for extending the benefits which have already resulted from the said Charter of Incorporation, it is desirable that additional powers should be granted for regulating the qualifications of persons who may carry on the business of Pharmaceutical Chemists: be it enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliment assembled, and by the authority of the same.

I. That the said Charter of Incorporation, granted to the said Society on the 11th day of February, 1843, save and except such part or parts thereof as are hereby altered, varied, or repealed, shall be and the same is hereby confirmed and declared to be in full force and virtue, and shall be as good and effectual to all intents and purposes as if this Act had not been passed.

II. The Council of the said Pharmaceutical Society shall be and the same are hereby authorized and empowered to alter and amend the bye-laws of the said Society, made and established under or in pursuance of the said Charter of Incorporation, and to make and establish such new or additional bye-laws as they shall deem proper and necessary for the purposes contemplated by the said charter or by this Act: provided always, that all such original bye-laws, and all altered, amended, or additional bye-laws, shall be confirmed and approved by a Special General Meeting of the Members of the said Pharmaceutical Society, and by one of her Majesty's principal Secretaries of State: provided also, that the existing bye-laws of the said Society shall continue in force until the next Annual Meeting of the said Society, to be held in the month of May, 1853.

III. At all meetings of the said Society at which votes shall be given for the election of officers, all Members entitled to vote may give their votes either personally, or, in cases of residence exceeding five miles from the General Post-office, St. Martin's-le-Grand, London, by voting papers authorized by writing, in a form to be defined in the bye-laws of the said Society, or in a form to the like effect, such voting papers being transmitted under cover to the secretary not less than five clear days prior to the day on which the election is to take place.

IV. The Council of the said Pharmaceutical Society shall, within three calendar months after the passing of this Act, appoint a fit and proper person as a Registrar under this Act, and the Council of the said Society shall have the power to remove the said registrar, or any future registrar to be appointed under this Act, from the said office, and from time to time to appoint a new registrar in the room of any registrar who may die, or retire, or be removed from

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office as aforesaid, and also to appoint and remove from time to time a deputy registrar, and such clerks and other subordinate officers as may be requisite for carrying out the purposes of this Act, and also to pay suitable salaries to the said registrar, deputy registrar, clerks, and officers.

V. The registrar to be appointed under, or by virtue of this Act shall from time to time make out and maintain a complete registrar of all persons being Members of the said Society, and also of all persons being Associates and Apprentices or students respectively, according to the terms of the Charter of Incorporation, and shall keep a proper index of the register, and all such other registers and books as may be required by the Council of the said Society, and may be necessary for giving effect to the bye-laws of the said Society, and to the provisions of this Act.

VI. All such persons as shall at the time of the passing of this Act be Members, Associates, Apprentices, or Students of the said Pharmaceutical Society of Great Britain, according to the terms of the said Charter of Incorporation, shall be registered as Pharmaceutical Chemists, Assistants, and Apprentices or Students respectively.

VII. The Registrar to be appointed under or by virtue of this Act shall be bound, on the application of any person paying one shilling, to certify under his hand whether or no any person whose name and address shall be furnished to him appears in the said register, or is a Member of the Pharmaceutical Society of Great Britain or not; and the certificate of such registrar, signed by the said registrar, and countersigned by the President or two Members of the Council of the said Society, shall, in the absence of evidence to the contrary, be sufficient evidence of the fact therein stated up to the date of the said certificate.

VIII. All such persons as shall from time to time be appointed under or in pursuance of the said Charter of Incorporation or the bye-laws thereof, or under this Act, shall be and the same are hereby declared to be fit and proper persons to conduct all such examinations as are provided for or contemplated by this Act, and shall respectively have full power and authority and are hereby authorized and empowered to examine all persons who shall present themselves for examination under the provisions of this Act in their knowledge of the Latin language, in Botany, in Materia Medica, and in Pharmaceutical and general Chemistry, and such other subjects as may from time to time be determined by any bye-law; provided always that such examinations shall not include the theory and practice of medicine, surgery, or midwifery; and the said examiners are hereby empowered to grant or refuse to such persons, as in their discretion may seem fit, certificates of competent skill and knowledge and qualification to exercise the business or calling of Pharmaceutical Chemists, or as the case may require, to be engaged or employed as Students, Apprentices, or Assistants respectively.

IX. And to enable the said Society to provide for the examination in Scotland of such Students, Apprentices, or Assistants in Scotland as may desire to be examined there, it shall be lawful for the Council of the Society, and they are hereby required, to appoint such fit and proper person in Scotland, to meet in Edinburgh or Glasgow, or such other place or places as the Council may think desirable, and to conduct there all such examinations as are provided for and contemplated by this Act, with such and the like powers and authorities in respect thereof as are herein conferred, and to grant to the persons to be so examined such and the like certificates as are herein before specified and referred to or to refuse the same; and all the provisions of this Act shall be equally applicable to the examiners, examinations, and parties examined in Scotland as to the examiners, examinations, and parties examined in England.

X. Every such person who shall have been examined by the persons appointed as aforesaid, and shall have obtained a certificate of qualifications from them, shall be entitled to be registered by the registrar according to the provisions of this Act, upon payment of such fee or fees as shall be fixed by the bye-laws; and every such person duly registered as a Pharmaceutical Chemist shall be eligible to be elected as a Member of the said Society; and every such person duly registered as an Assistant shall be eligible for admission as an Associate of the said Society; and every such person duly registered as a Student or Apprentice to a Pharmaceutical Chemist shall be eligible for admission into the said Society, according to the bye-laws thereof.

XI. That no person who is a member of the medical profession, or who is practising under right of a degree of any university, or under a diploma or licence of a medical or surgical corporate body, shall be entitled to be registered under this Act; and if any registered Pharmaceutical Chemist shall obtain such diploma or licence, his name shall not be retained on the said register during the time that he is engaged in practice as aforesaid.

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XII. From and after the passing of this Act, it shall not be lawful for any person, not being duly registered as a Pharmaceutical Chemist according to the provisions of this Act, to assume or use the title of Pharmaceutical Chemist or Pharmaceutist in any part of Great Britain, or to assume, use, or exhibit any name, title, or sign implying that he is registered under this Act, or that he is a member of the said Society; and if any person, not being duly registered under this Act, shall assume or use the title of Pharmaceutical Chemist or Pharmaceutist, or shall use, or assume, or exhibit any name, title, or sign implying that he is a person registered under this Act, or that he is a Member of the said Society, every such person shall be liable to a penalty of five pounds; and such penalty may be recovered by the registrar to be appointed under this Act, in the name and by the authority of the Council of the said Society, in manner following (that is to say),

In England or Wales, by plaint under the provisions of any Act in force for the more easy recovery of small debts and demands:

In Scotland, by action before the Court of Session in ordinary form, or by summary action before the sheriff of the county, or in the royal burghs before the magistrates of the burghs where the offence may be committed or the offender resides, who, upon proof of the offence or offences, either by confession of the party offending, or by the oath of affirmation of one or more credible witnesses, shall convict the offender, and find him liable in the penalty or penalties aforesaid, as also in expenses; and it shall be lawful for the sheriff or magistrates, in pronouncing such judgment for the penalty or penalties and costs, to insert in such judgment a warrant, in the event of such penalty or penalties and costs not being paid, to levy and recover the amount of the same by poinding:

Provided always, that it shall be lawful to the sheriff or magistrate, in the event of his dismissing the action and assoilzeing the defender, to find the complainer liable in expenses; and any judgment so to be pronounced by the sheriff or magistrate in such summary application shall be final and conclusive, and not subject to review, by advocation, suspension, reduction, or otherwise.

XIII. Provided always, that no action or other proceeding for any offence under this Act shall be brought after the expiration of six months from the commission of such offence; and in every such action or proceeding, the party who shall prevail shall recover his full costs of suit or of such other proceedings.

XIV. All and every sums and sum of money which shall arise from any conviction and recovery of penalties for offences incurred under this Act, shall be paid as the Commissioners of her Majesty's Treasury shall direct.

XV. If any registrar under this Act shall wilfully make or cause to be made any falsification in any matters relating to any register or certificate aforesaid, every such offender shall be deemed guilty of a misdemeanor.

XVI. If any person shall wilfully procure by any false or fraudulent means a certificate purporting to be a certificate of registration under this Act, or shall fradulently exhibit a certificate purporting to be a certificate of membership of the Pharmaceutical Society, every such person so offending shall be adjudged of a misdemeanor.

(To be concluded in our next.)

NEW RESEARCHES ON THE PRINCIPLE OF HEMLOCK AND ON ITS APPLICATION TO CANCEROUS DISEASES.

By M. Devay, Physician to the Hospital at Lyon, and M. Guillermond, Pharmacien.

M. Devay and Guillermond, in a little work, have treated of the advantages which may be derived from the application of conicine to cancerous diseases and refractory swellings, when care is taken to employ preparations in which this principle is well preserved. We give an abstract of this very important work, paying attention especially to the pharmaceutical part of the work, which is particularly interesting to our readers.

When we read attentively and without prejudice the observations of the practitioners of the last century who have published cases of cancer cured by the employment of hemlock, we cannot deny to this substance a real therapeutical value. However, we have seen administered and have ourselves administered considerable doses of extract of hemlock without any appreciable effects. When the variety of the preparations has not failed, their therapeutical energy has been deficient. However, it is not every day that hemlock is prescribed. It seems that physicians cannot make up their minds to abandon its employment, suspecting that all has not been said concerning this plant, and that so much want of success must be at-

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tributed to the unfaithfulness of the preparations.

The principle which confers on hemlock the power of its poisonous and medicinal effects is conicine. But it is very difficult, almost impossible, to preserve in the ordinary preparations of hemlock a principle which is so easily decomposed; this would lead us to think that it would be advantageous to employ only the alkaloid itself; but, besides the difficulties which its preparation presents, it is eminently alterable, and we have been led to think, with M. Soubeiran, that these two circumstances would always be an insurmountable obstacle to its employment. We then thought of the fruit of hemlock, in which the active principle is concentrated; the proportion of it is more equal than anywhere else. The odor of the pharmaceutical preparations obtained with the fruit is perfectly different from that disengaged by the ordinary extracts, the decoction of the leaves, &c. It is an odor of roasted flesh and celerys.

We have made a great number of experiments for comparing the relative degree of energy of the ordinary preparations of hemlock with that of the seeds. One indisputable truth flows from our experiments, and that is, that the ordinary extract of hemlock does not approach the powder of the seeds in poisonous effects. In the same doses, and even in smaller quantity, the latter causes death, whilst the former only produces transient effects. The chemical application has moreover come in confirmation of these results, and has shown the good effects which may be obtained from hemlock in the treatment of cancers and refractory swellings.

Having proved both by experiment and by reasoning, that the fruits of hemlock should henceforward replace all the preparations of this plant employed in medicine, it remains for us to show the advantage which we have derived from it. It is in the first place of the greatest importance that the fruits of hemlock employed should be those of the great hemlock, and that they be not mixed with others of the family of umbelliferæ. The following are their characters. They are almost globular, with five indented sides. They have not, like most umbelliferæ, a peculiar aromatic odor; the latter appears to be covered by that of conicine. The Æthusa Cynapium, the phellandria, the anise, &c.,* have fruits which physically bear much resemblance to that of hemlock; but when the latter are powdered, the characteristic odor developed is sufficient for their recognition. Another precaution relates to the period at which these fruits are collected. Those used in our experiments and preparations had arrived at full maturity. It is at this period that they should be collected for medical use, because, at this time, they are isolated, as it were, from the plant which has produced them; the active principle then resides in them in a true state of concentration and fixity.

I.—FORMULÆ FOR INTERNAL USE.

The fruits of hemlock do not require to undergo any very complicated pharmaceutical transformations; they are sufficiently active of themselves to be employed in their natural state. A simple manipulation appeared to us necessary for facilitating their employment: that is, to reduce them to powder and to form pills, which, when covered with an envelope of sugar, may be kept for any length of time. We have thought it advisable to have pills of two degrees of strength, and their formulæ are as follows:

Pills No. 1—Take 1 gramme of recently pulverised hemlock fruits; make with a sufficient quantity of sugar and syrup, a mass to be divided into 100 pills, which are to be covered with sugar in the same manner as comfits, and which are to be of the weight of 10 centigrammes. This number should be sufficient for persons who are not yet accustomed to the medicament and who are of delicate temperament. We commence with 2 pills the first day, and go on progressively to 10, 15 or 20, increasing by one each day. It then becomes more convenient to employ the pills No. 2.

Pills No. 2.—Take five grammes of recently pulverised fruits of hemlock; incorporate them with a sufficient quantity of gum and sugar to make a mass, which is to be divided into 100 pills, which are to be covered with an envelope of sugar. Each pill will weigh 25 centigrammes.

Tincture and Syrup.—Alcohol is the best solvent that can be applied to the seeds of hemlock, and for exhausting them of their active principle a much less quantity than of any other vehicle is required; it has moreover, the advantage of preserving the conicine.

We will complete the series of internal medicaments by giving the formula of a *syrup of conicine*, which will be of the greatest utility to the practitioner.

Exhaust 10 grammes of hemlock fruits with alcohol of 28° say 60 grammes, to form a tincture, which is to be added to 3000 grammes of syrup, and aromatised, *ad libitum*.

* Some medical journals have recently published a case of poisoning owing to the confusion of the seeds of anise with those of hemlock.

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30 grammes of this syrup represent 1 decigramme of hemlock seeds or 1 milligramme of conicine; 1 spoonful being equivalent to 30 grammes of syrup, the patient who takes 1 pill of No. 2, may take a half spoonful of our syrup.*

According to our researches, the following is the proportional quantity of conicine contained in the internal medicaments of which we have just given the formulæ:—1 gramme of the powder of the fruits contains 1 centigramme of conicine: 1 decigramme gives 1 milligramme of conicine: 5 centigrammes (weight of our pills) give half a milligramme.

2.—FORMULÆ FOR EXTERNAL USE.

Balsam of Conicine.--The process which we follow for preparing the balsam of conicine warrants us in giving it this name. It is indeed a true solution in fat of conicine freed from the principles which retained it in its natural combination, and as pure as the processes which we propose for extracting it admit of.

Thus, after having exhausted the fruits of hemlock with alcohol, and after having separated the conicine from it as much as possible by means of ether and caustic potassa, keeping to the precautions indicated further on, we take ethereal solution of hemlock, resulting, for instance, from the exhaustion of 100 grammes of hemlock fruits, and 200 grammes of well washed recent lard. We begin by evaporating the ethereal solution in the open air, that is to say, by pouring it little by little into a plate and as soon as the greater part of the ether is eliminated and the conicine begins to appear on the plate under the form of small yellow drops, separating from the remainder of the vehicle, the lard is gradually incorporated with it, stirring continually to evaporate the remainder of the ether. We thus obtain a balsam of conicine which will be found very active and convenient for use.

The following is the mode of preparing the ethereal tincture of hemlock.

We evaporate to the consistence of a syrup the alcoholic tincture resulting from the complete exhaustion of 100 grammes of the fruits, and re-dissolve in a small quantity of water. The latter leaves undissolved a very thick, green oil, completely soluble in ether, and whose quantity amounts to 30 grammes. After having separated this green oil, if the product of the alcoholic evaporations be washed with ether, we extract also a yellow resinous substance, which has no action on litmus paper, and which has a powerful odor *suigeneris*, different from that of conicine.

After having subjected the mother liquors of the alcoholic extract to this preliminary treatment, we introduce them into a flask of the capacity of three times their bulk, and treat them with a concentrated solution of caustic potassa and successively with rectified sulphuric ether. Immediately on the addition of the potassa, a very distinct odor of conicine was manifested in the mixture, and the ether acquired a strong alkaline reaction. We left the same ether (about 20 grammes) in contact with the mixture for 12 hours agitating very frequently. Finally it was decanted and replaced by fresh ether, and we continued thus until the ether was almost insensible to litmus paper. We remarked that the 20 grammes of ether first put in were charged with almost all the alkaline portion. 100 grammes of well rectified ether sufficed for exhausting almost entirely of its alkaloid the extractive and alkalised mixture resulting from 100 grammes of hemlock fruits.

Liquor of Conicine for Injections.--In this preparaton, we employed lime water instead of ordinary water. We have said besides that the tincture of hemlock did not give out the odor of conicine, but when lime water is added to it, this odor is instantly developed in a high degree; the conicine is disengaged by the lime from its saline combination and remains in the free state in solution in water.

We have sometimes prescribed pills and and a pommade made with conicine obtained from Germany: *

Conicine	.. ..	1 gramme
Lard	.. ..	80 „

This preparation had little odor and little action, either because the product was impure or because the conicine had been evaporated during its trituration with the fat. It was the same with the pills supposed to contain 1 milligramme of this conicine. This proves again that as a fact in materia medica, it is not always beneficial to isolate

* A spoonful of syrup weighs 20, and not 30 grammes. The syrup appears to us to be better prepared in the following proportions.

Fruits of hemlock 10 grammes, syrup 2000 grammes. A spoonful of syrup would correspond to 10 centigrammes of hemlock seeds; it would also be better, as it appears to us, to retain for this syrup the name of the seeds, instead of applying to it that of the alkaloid which is still in the saline state and mixed with other principles.

* We have long suspected that this pretended conicine was no other than nicotine, or at least that this latter substance existed in it in large proportion.

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principles which act not only by themselves, but also by the whole of the elements which surround them, and serve them as corrections and adjuvants in an object foreseen by nature.--*Journal de Pharmacie*, May, 1852.

LIQUOR MAGNESIÆ CITRATIS.

THOS. S. WIEGAND, PHILADELPHIA.

The attention which has been given to this article by pharmaceutists, both on account of its pleasentness and its great tendency to change, has induced me to offer the following observations.

The advantage of the plan proposed is that a perfectly satisfactory article can be furnished in five or eight minutes, thus rendering unnecessary any attempt to make the preparation permament at the expense of its remedial value. That this is the manner in which the public are supplied, save at stores where large quantities are sold, there can be but little doubt, from the experiments of Professor Proctor of Philadelphia, detailed in the 23rd volume of the American Journal of Pharmacy, p. p. 214 and 216, which show conclusively that a permanent solution of citrate of magnesia must be a decidedly acid one.

Another method for making a soluble citrate has been devised by Dorvault, which is published in his treatise, entitled "l.'officine;" but from certain difficulties in manipulation his process cannot come into very general use.

The formula offered is—

Take, of carbonate of magnesia, in powder, five drachms, boiling water five fluid ounces, throw the magnesia upon the water in a shallow vessel, when thoroughly mixed, pour five sixths of the pulp into a strong quart bottle, fitted with cork and string for tying down; then make a solution of seven and a half drachms of citric acid in two fluid ounces of water, pour it into a magnesia mixture, cork and tie down immediately; when the solution has been effected (which will require but a minute and a half, or two minutes,) empty it into a bottle capable of holding twelve fluid ounces, containing two fluid ounces of syrup of citric acid, add the remaining pulp of carbonate of magnesia, nearly fill the bottle with water, and cork instantly, securing it with twine or wire; if the carbonate be of good quality it will be entirely dissolved in seven minutes.

Of course it is not intended the carbonate of magnesia can be rubbed to powder, the water boiled, the bottles washed and fitted with strings and corks in the time above mentioned. My plan is to have the bottles prepared with their corks, strings, and syrup in advance, and to keep the carbonate of magnesia in a state of powder for this purpose.—*New York Journal of Pharmacy*, May, 1852.

DRAUGHT OF THE CURATE OF DEUIL.

Among the medicine extolled by the populace in France, must be placed in the first rank the preparation originally administered by an ecclesiastic, M. Hurel, who was curate of the commune of Deuil, arrondissement of Pontoise (Seine-et-Oise).

But the formula of M. Hurel's medicine has not hitherto been known, and every herborist (for the herborists are in possession of the preparation of this medicine), modifies this formula according to the incorrect information given to him.

M. Gardes, Pharmacien at Villiers-le-Bel, has just published the true formula of M. Hurel's preparation, he possesses the original in the hand writing of its author.

This is the formula:—

R. Root of mallow, cut..	15	grammes.
Root of dock	15	,,
Dog's grass	15	,,
Stick liquorice	15	,,
Chicory leaves	8	,,

Boil these five substances for ten minutes in 3 bottles of water, and add

	grammes.
Ground follicles of Paltha senna..	20
Bruised china rhubarb	4
Sulphate of soda..	4

Leave the whole to infuse for two hours, and strain through a sieve.

Drink in the morning, for two or three days according to the effect.

This medicine, prepared according to the above formula, second perfectly when a host of other purgatives fail. It presents only the inconvenience of a large quantity of liquid to be drank; this quantity may be diminished without disadvantage, and instead of 3 bottles of water (2 quarts) 1, quart, even a pint of water may be used, but the dose must always be devided into two or three days.—*Journal de Chimie Medicale*, July 1852.

NOTICE.—*All Communications, Books for Review and Substance for Notice must be addressed* " To the Editors of THE CHEMIST, care of Messrs. Piper Brothers & Co., 23, Paternoster Row, Londor *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following No. will in future be received as late as the 20th.*

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THE CHEMIST.

[NEW SERIES.]

I. CHEMISTRY.

"CHEMICAL REPORT ON THE WATER SUPPLY OF BRISTOL."

BY THORNTON J. HERAPATH, ESQ., ASSISTANT LECTURER ON PRACTICAL CHEMISTRY IN THE BRISTOL SCHOOL OF MEDICINE, &c., &c.

(*Concluded from page* 502.)

VI.—WATER OF THE PUBLIC CONDUITS.

THERE are several public conduits in Bristol, all of which are very ancient: the principal are St. John's pipe, Redcliffe pipe, Temple conduit, St. Thomas' pipe, All Saints' conduit, and the Quay pipe.

I.—St. John's Pipe.

Situated in Nelson street, near St. John's Church. It is supplied from a spring on the millstone-grit, on the side of Brandon hill, near the top of Park street, which in former times was made use of by the Carmelite friars who possessed a monastery on the right side of the Froome, over against the Quay.

A gallon of the water gave on analysis the following number:—

	Grains.
Chlorine	2·840
Sulphuric acid	2·571
Carbonic acid (in combination)	22·646
Nitric acid	5·056
Lime	32·259
Magnesia	1·857
Soda	0·384
Potash	4·380
Sesquioxide of iron	traces
Silica	0·480
Organic matter	2·080

Composition of the water per gallon:—

Chloride of calcium	3·224
Chloride of sodium	0·720
Chloride of potassium	0·699
Sulphate of lime	4·371
Nitrate of magnesia	6·864
Nitrate of lime	0·072
Organic matters	2·080
Carbonate of lime	51·469
Carbonate of magnesia	traces
Carbonate of the protoxide of iron	traces
Silica	0·480
	69·979
Saline residue, as determined by direct experiment	70·08

Hardness . . about 57°

The above specimen was collected on the 24th of last month.

II.—Redcliffe Pipe.

This derives its supply of water from a spring on the lias, called "Huge Well," situated about a quarter of a mile S. S. E. from Lower Knowle. After passing a considerable distance, the water is received in a tank at the corner of Redcliffe Churchyard, which is open to the public during certain hours of the day.

A gallon of the water yielded on analysis:—

	Grains.
Chlorine	5·968
Sulphuric acid	2·927
Carbonic acid (in combination)	9·343
Nitric acid	traces
Lime	13·402

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Magnesia	1·344
Soda	3·769
Potash	minute traces
Sesquioxide of iron	traces
Silicic acid	0·960
Organic matter	traces

Composition of the water per gallon :—	
Chloride of magnesium	2·304
Chloride of sodium	7·067
Sulphate of potash	minute traces
Sulphate of magnesia	0·699
Sulphate of lime	4·184
Nitrate of magnesia	traces
Organic matters	traces
Carbonate of lime	20·856
Carbonate of magnesia	0·317
Carbonate of the protoxide of iron	traces
Silicic acid	0·960
	36·387
Hardness	24·1 deg.

The permanent hardness amounted to about 5°.

It is well to observe that the above specimen was collected after long-continued rain.

III.—St. Thomas' Pipe.

This is a continuation of that of Redcliffe.

IV.—All Saints' Pipe.

The water for this is obtained from a spring which rises in the upper part of the mountain limestone series, in Maudlin lane. It was originally granted to the parish of All Saints by the Grand Prior and Proctor of the Priory of St. James; and was conveyed through leaden pipes to Corn street, where there was a cistern open to the public. Latterly, however, free access to this conduit has been denied, and the parishioners only are now permitted to use it.

A gallon of the water gave on analysis :—

	Grains.
Chloride of calcium, Chloride of magnesium, Chloride of sodium, Chloride of potassium, Nitrates, Organic matter	31·36
Sulphate of lime	20·08
Earthy carbonates	18·31
Silica	0·65
	70·40

The above specimen was collected on the 23rd of last month.

V.—The Quay Pipe.

This is situated at the corner of Quay street, and is open to the public for seven or eight hours in the day; namely, from seven to ten in the morning, and from about three to seven in the evening.

The water with which it is supplied is obtained from a withy-bed, on the lias, lying to the north-eastward of the Orphan Asylum, on Ashley Hill, and between the high land of Ashley Court and the mill-stream that flows from "the boiling well." Hence it is conveyed through pipes of lead to the city.

The water is much esteemed on account of its purity, and was formerly made use of by nearly all the shipping of the port.

A specimen of the water, collected on March 31st ult., gave on analysis the following numbers :—

	Grains.
Chlorine	20·914
Sulphuric acid	8·951
Carbonic acid (in combination)	10·419
Nitric acid	traces
Lime	17·680
Magnesia	2·152
Soda	17·261
Potash	traces
Oxide of iron	traces
Silica	0·411
Organic matter	2·480

Composition of the water per gallon :—	
Chloride of magnesium	5·164
Chloride of sodium	28.403
Sulphate of lime	10·730
Sulphate of soda	4·752
Sulphate of potash	traces
Nitrates	traces
Carbonate of lime	23·680
Carbonate of magnesia	a little
Carbonate of iron	a little
Organic matter	2·480
Silica	0·411
	75·620
Solid residue, as determined by direct experiment	75·70

The composition of this water, however, appears to be subject to much variation, for two other specimens, collected at different periods, were found to contain only 47·2 and 63 grains, respectively, of solid matters per gallon.

VI.—Temple Conduit.

This is supplied by a spring called "Ravens-well," on the high bank of the Avon, near the turn of the Bath road from Totterdown.

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The conduit was out of repair when visited by me, and therefore I was unable to obtain a specimen of the water for analysis.

VII.—Well Water.

I.—Public Wells.

The wells which appear to be most commonly used by the public are those in Wine-street, the Pithay, Thomas-street, and Peter-street.

The analyses of the waters of these wells are given below, together with those of two others in the Old Park, which, though not strictly public, are much resorted to by the inhabitants of St. Michael's Hill and the surrounding neighbourhood.

	Wine Street.			St. Peter's Pump.		Vine Row, Old Park.	
	Specimen A.; Oct. 1848.	Specimen B.; Dec. 1851.	Specimen C.; April 1852.	Specimen A.; Oct. 1851.	Specimen B.; Nov. 1851.	Spec. A.; Oct. 1848.	Spec. B.; Oct. 1851
Chlorine	20·698	14·238	20·238	18·866	27·825	14·203	13·689
Sulphuric acid	14·652	10·885	14·061	19·385	15·120	14·094	16·000
Carbonic acid (in combination)	11·103	9·289	9·117	10·136	12·080	9·414	8·629
Nitric acid	2·294	3·598	3·228	4·093	4·893	3·540	3·307
Phosphoric acid	traces.	traces.	traces.	traces.	traces.	?	?
Strontia*	do.	do.	do.	do.	do.	traces.	traces.
Lime	22·478	17·865	18·328	22·279	23·587	24·008	24·263
Magnesia	3·854	2·852	4·360	7·988	5·742	1·144	0·783
Soda	12·602	9·792	13·453	11·397	19·276	9·361	9·232
Potash	5·555	3·209	4·990	0·625	0·856	1·845	1·876
Sesqui-oxide of iron	0·041	0·027	0·029	0·038	0·070	traces	a little
Silicic acid	0·765	0·810	1·120	0·533	0·600	0·160	0·222
Organic matters	2·400	2·240	2·112	4·579	3·040	5·560	5·171

* *Vide* a paper "On the existence of strontia in the well-waters of Bristol," recently communicated to the Chemical Society of London; also *Chemical Gazette*, No. 234, p. 279.

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	Wine Street.			St. Peter's Pump.		Old Park.		Park Place; Nov. 1851.	Pithay; March 1852.	Thomas Street March, 1852.
	Sp. A.	Sp. B.	Sp. C.	Sp. A.	Sp. B.	Sp. A.	Sp. B.			
Chloride of calcium	.....			....	.....	1·824	1·621			
Chloride of magnesium	1·761	1·02	1·599	8·027	6·259	1·448	1·099	39·870	34·64 Containing 11·92 grs. of Sulphate of lime.	67·92 Containing 14·88 grs. of Sulphate of lime.
Chloride of sodium	25·204	18.36	25·308	21·370	38·551	17·552	17·312			
Chloride of potassium	8·864	5·12	7·960	. .....		2·944	2·991	3·690		
Sulphate of lime	24·909	18.50	23·904	23·132	22·120	23·960	27·200	35·390		
Sulphate of magnesia	.....			10·725	2·043	.....		.....		
Sulphate of potash	.....			1·157	1·603	.....		.....		
Nitrate of lime	1·426	1·06	1·506	.....		5·376	5·023	8·232	15·71	
Nitrate of magnesia	2·958	3·96	3·065	5·610	6·706	.....		8·288		
Nitrogenous organic matters.	2·400	2·24	2·112	4·579	3·040	5·560	5·171	4·800	3·20	2 64
Sulphate of strontia	traces.	traces.	traces.	traces.	traces.	traces.	traces.	traces.	traces.	traces.
Phosphate of lime	do.	do.	do.	do.	do.	?	?	?	do.	do.
Carbonate of lime	19·520	17·65	16·019	21·810	25·856	20·168	18·815	15·130	21·04	29·76
Carbonate of magnesia	4·800	2 87	3.917	1·032	1·344	1·032	0·676			
Carbonate of the proto-oxide of iron	0·060	0·04	0·042	0·056	0·101	a little.	a little.	a little.	a litle.	a little.
Silica	0·765	0·81	1·120	0·533	0·600	0·160	0·222	1·160	1·12	0·24
	92·667	71·63	86·552	98·031	108·223	80·024	80·130	116·560	75·71	100·56
Solid matters as determined by direct experiment	92·710	71·69	86·601	97·960	108·315	80·126	80·440	116·690	75·98	100·63

II.—Private Wells.

As regards my analyses of the waters of private wells, they are so numerous that it would be almost impossible for me to give the whole of my results. I shall therefore content myself by enumerating the most important of them. These are subjoined in the tabular form, together with a brief summary of all the analyses contained in the preceding pages. The latter are added for the sake of comparison.

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	Solid matters per gallon (grains.)*	Hardness. (Clarke's scale.)
Rain-water from tanks and cisterns..	1·99 to 8·30 ..	1·5 to 6·1 degrees. Permanent hardness about 2°·9 (?)
Water of Water-works Company ..	16·96 to 19·10 ..	12°·6 to 14°·3; permanent hardness 1°·5 to 1°·75
Stream at Rownham mills, Leigh woods † ..	19·75 ..	harder than either of the preceding.
River Avon, at Hanham	20·03 to 21 ..	undetermined.
River Avon, at Crew's Hole	22·72	10°·25 to 12°; permanent hardness, about 3°.
Feeder, at St. Philip's bridge ..	22·40	about 12°·25.
Floating Harbour	29·00	about 13°.
Spring at the Black-rock, near the Old Hotwell-house†	27·12	harder than any of the preceding.
River Froome, at Iron Acton ..	30·28	ditto.
Redcliffe-pipe (Huge Well)	36·87	24°·1; permanent hardness about 5°.
Richmond-spring, Clifton †	43·18	harder than any of the preceding.
Well-water, Bridewell	43 to 44 ..	ditto.
Boiling well, mill-stream, (December, 1851)‡	44·32	undetermined.
River Froome, at Stapleton	44·5 to 47·1 ..	20° to 21°·25
Well waters from—		
Cheese-lane, St. Philip's	44·53	very hard.
Eastfield, near Westbury	45·76	ditto.
Jacob's Wells	46·32	25° to 26°·5

* In order to fully comprehend the above table and the preceding analyses, it is necessary to bear in mind the following facts; namely—

1st. That the purer the water the smaller is the amount of solid matters that it leaves on evaporation to dryness.

2nd. That of two waters the purest, though not always the most palatable, is undoubtedly the best adapted for most domestic and manufacturing purposes—as, for instance, washing, brewing, the production of steam, &c.

3rd. That each degree of hardness, according to Clarke's scale, corresponds to one grain of carbonate of lime (chalk) per gallon, or to an equivalent quantity of some other earthy salt,—as, for instance, sulphate of lime, &c.—capable of decomposing soap; and

4th. That the loss of soap which occurs in washing with "*hard*" water amounts, with every gallon of water employed, to about ten grains by weight for each degree of hardness; or, in other words, ten grains of soap per gallon are required in order to soften the water, and render it capable of affording a lather on agitation.

‡ The water of "the Boiling Well," at the spring head, is so highly charged with bicarbonate of lime, that if objects are immersed in it they soon become coated with a calcareous incrustation.

The "*boiling*" of the spring is occasioned by the evolution of carbonic acid gas.

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The Philosophical Institution, Park Street.	50·38
Mr. ——? Charlotte Street ..	50 to 53
Pump, St. James' Terrace ..	50 to 51
Mr. B——'s, Corn Street	52·80
Hampton Terrace, W. Clifton ..	53·44
Mr. T——'s, Park Street	54·72
Mr. P——'s, Bedminster	55·60
Boiling-well, mill-stream, (about 200 yards below the mill) ..	57·68
Quay-pipe or Conduit	very variable. 47·25 to 75·62
Well waters from—	
Sion-spring, Clifton†	60·46
Brewery, Hampton-terrace ..	61·44
Merchants' Almshouse, Saint Michael's Hill	62·24
Bank-Court, Corn-street	63.20
——? Bedminster	63·28
Pithay Pump	63·74
Nelson Street	65·60
Bishop's palace, Stapleton† ..	67·44
St. John's-pipe	69·97
All Saints'-pipe	70·40
Saint James' Square, (No. 16) ..	73·92
Pump, Vine Row, Old-park ..	80·02 to 80·13
River Froome, Baptist-mills—	81·38
Well waters from—	
Mr. W——'s, Redcliffe-hill ..	83·76
St. Peter's pump	very variable. 85 to 108·2
Almshouse, Stoke's Croft	86.50
Pump, Wine Street	variable. 71·66 to 92·66
Pump, Thomas Street	100·56
Mother Pugsley's well .. about	103
Foster's Almshouse, St. Michael's Hill	102·16
Mr. W——'s, Christmas Street..	105·36
Upper Easton.. .. .. about	111
St. Vincent's parade, Hotwells ..	112·90
Pump, Park-place	116·56
Mr. E——'s, Cotham New Road	118·72
A Spring at Coal-pit, Upper Easton	133·20
River Avon, at Rownham-ferry; (low tide)	111·32
Well-water from Her Majesty's Gaol, New Cut..	269·28
River Avon, at Rownham-ferry; (high tide)	880·01
Bristol Channel	1017.96

All these well-waters are extremly hard; the hardness varying from 35° to 85° or 90°.

The above table will enable the reader to form a correct idea of the general characters of the water that is met with in different parts of the city. For a few of the determinations just given I am indebted to my father, Mr. William Herapath. These are distinguished by a †.

It may perhaps be thought strange that no mention is made, in the foregoing analyses, of the gaseous constituents of the waters. This arises from the fact that I have convinced myself that the determination of these substances is of no practical value, inasmuch as the proportion varies at difierent seasons. From repeated examinations of the same water I have found very remarkable variations, even within a few days.

The well-waters of Bristol, as might be

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anticipated, differ very much in composition, in consequence of the diversity in nature of the geological strata upon which the city stands. Including under the general term Bristol, Clifton, the Hotwells, Bedminster, Easton, and other suburbs, the formations met with here may be said to be eight in number, which taken in their order of superposition are as follows:—

1°—Alluvium
2°—Lias
3°—New red sandstone
4°—Magnesian limestone
5°—Coal measures
6°—Millstone grit
7°—Carboniferous or mountain limestone.
8°—Old red sandstone.

The waters derived from these formations are of course indebted for their mineral constituents to the strata through or over which they flow; and may be divided, as my father has already pointed out, into three classes, according to the nature of the predominating ingredients.

Those of the first class contain much carbonate of lime and carbonate of magnesia, and have their source in the mountain limestone and magnesian conglomerate districts of Clifton and Redland. Some of them contain as much as 30 or 40 grains of earthy carbonates per gallon.

Those of the second class are exceedingly rich in the earthy and alkaline sulphates; and are met with in the coal-measures and in the liassic districts of Cotham, Pyle Hill, and Horfield.

The waters from the upper beds of the lias, I may observe, differ essentially from those from the lower strata in containing a much larger comparative proportion of the sulphates of soda and magnesia; though the latter, like those of the coal-measures, are generally much richer in sulphate of lime. Some of these waters are sensibly aperient, and hence are unsuited for ordinary use. Two of this description from Horfield, examined by my father and self in 1847, were found to contain between 60 and 70 grains of sulphate of magnesia per gallon. The most selenitic water, that I have analysed, from this neighbourhood, was obtained from Cotham New-road: it contained something more than 70 grains of sulphate of lime per imperial gallon.

The large proportion of sulphuric acid in such waters is explained by the nature of the strata, which consist for the greater part of argillo—calcareous schists very rich in pyrites, in gypsum, and magnesian limestone.

Waters belonging to the third class hold in solution a large amount of earthy and alkaline chlorides. These are chiefly derived from the new red sandstone or saliferous formation and from the alluvial beds on which a large part of the city is built. One specimen of this kind I found to contain 203 grains of common salt, &c., in a gallon; the majority of them, however, usually contain only 30 or 40 grains per gallon.

Generally speaking, the water from the mill-stone grit and old red sandstone is the best, and is even superior to that from the mountain lime-stone, though the latter, as is well known, is much liked for drinking by those who are accustomed to its use. The water from these formations, however, is always very hard, and is hence inapplicable to many manufacturing operations, though it is worthy of remark, that much of the hardness disappears on boiling the water, in consequence of the precipitation of the gas-dissolved carbonate of lime. In this respect it possesses a great advantage over the selenitic water of the lias and coal measures, in which, as I have before pointed out, the predominant earthy ingredient conferring the property of hardness, is sulphate of lime, which being held in solution without the intervention of carbonic acid, is not removed by boiling. Good water, it is said, was at one time obtained from the alluvial drifts forming the low grounds which follow the course of the Froome and Avon; but of late years the well-waters in these localities have become tainted with sewage, that has escaped from the cesspools and sewers, which have been excavated here.

Writing on this subject, Sir Henry de la Beche observes*:—"It can scarcely be "doubted that in many other localities than "on the alluvial flats, cesspool fluids find "their way into the wells. In the porous "red sand-stones this must often happen, "affording as they do such facilities for absorbing them, and cesspools and wells are "intermingled in the districts composed of "this rock. The water from the ancient "well or pump of St. Peter (formerly known "as the well of St. Edith, and made by "Canynge, the founder of St. Mary, Redcliffe), in red sandstone, is considered "better for making tea, than those near it; "a character perhaps due to the percolation "to it of the filthy waters of the Frome and "Float. When the Float water has been "out, this well has been known to be pumped dry."

The truth of this conjecture is proved by the fact that most of the well-waters of

* Health of Towns Commission. Report on the state of Bristol, &c. p. 14.

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Bristol contain nitric acid, in the form of nitrate of lime or nitrate of magnesia;—indeed, as I have already shown many of them hold in solution considerable quantities of this substance. Now, as we know that rain water usually contains only mere traces of nitric acid, and as I have been unable to detect more than a minute proportion of it in wells situated in country places, it is obvious, that its presence in the city-wells can only be caused by the infiltration of animalized matters from the sewers, &c., the nitrogenous portion of which is, by the slow operation of the air, gradually oxidized and converted into nitric acid,—just in the same manner as that substance is formed, as is well known, when the excretions of animals or other matters rich in nitrogen are allowed to remain in contact for some time with calcareous earth.

It is to the same cause that I am disposed to attribute the occurrence of potash in most of the well-waters I have examined, inasmuch as none of the rocks met with in this neighbourhood contain more than a very minute proportion of this mineral compound.

The following table gives the amount of nitric acid and potash in grains, per imperial gallon, which I have succeeded in separating from certain wells:—

	Nitric acid.	Potash.
Pump, Park-place	11·468 ..	undetermined.
,, Pithay	about 10·1 ..	do.
Christmas Street	5·3 ..	6·54
St. Peter's pump	4·093 to 4·893	0·625 to 0·856
Pump, Vine-row	3·307 to 3·54	1·845 to 1·876
,, Wine-street	2·294 to 3·598	3·209 to 5·555
,, St. James'-terrace ..	2·713	1·312
Mr. B——'s, Corn-street ..	2·011	1·203
——— ?, Bedminster ..	1·502	0·514
Hampton terrace	1·462	0·314
Cotham New-road	0·321	0·151
Eastfield, near Westbury ..	0·051	traces

General Conclusions.

From the facts and analyses mentioned in this report, I have arrived at the following conclusions:—

1st.—That the water supplied by the Bristol Water-works Company is much superior as regards freedom from saline and organic impurity, to all the spring and river waters that are met with near Bristol, and hence is better adapted than them for most domestic and manufacturing operations.

2nd.—That after boiling, it is even softer than the rain water which is ordinarily obtained from cisterns and tanks.

3rd.—That it is worthy of remark that the predominant ingredient of the Company's water is carbonate of lime, as Professor Clarke has proved that the whole of the gas-dissolved carbonate of lime in waters may be easily and cheaply removed by the judicious application of caustic lime.

4th.—That were this purifying process adopted by the Company, the water in question might be rendered equal in softness to that obtained from the plutonic formations of Scotland and the north of England, and with which the towns of Aberdeen, Glasgow, Edinburgh, &c. are supplied.*

5th.—That the waters of the Avon and Froome, even on their entrance into the city are largely contaminated with animalized matter.

6th.—That all the well-waters of Bristol and Clifton, without exception, contain an unusually large proportion of fixed impurities, varying from 43 to 269¼ grains per imperial gallon.

7th.—That the waters from the millstone grit, old red sandstone, and mountain limestone appear to be the purest and the best suited for drinking, but are extremely hard even after boiling.

8th.—That the most impure waters are met with on the new red sandstone and alluvial formations, where in consequence of the nature of the strata, many of the well-waters become contaminated with sewage matters, &c.

9th.—That this occurrence, as respects the contamination of the well-waters with sewage, is very common in Bristol, and takes place to a greater or less degree in most parts of the city and its suburbs.

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* Dr. Clarke, of Aberdeen, says a correspondent of the *Builder*, has stated the hardness of water for various towns as follows:—

Aberdeen	1°
Glasgow about	4½
Edinburgh	5°
Newcastle-upon-Tyne ..	5°
Pipe-water of London ..	11° to 16°
Pipe-water of Manchester ..	12°
Paris, harder than any of the above.	
Wells in London	40° to 80°

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REPORT ON THE WATER SUPPLY OF THE TOWN OF PRESTON.

BY PROFESSOR CRACE CALVERT.

(Concluded from page 485)

CONSIDERATION OF THE EMPLOY OF THE WATERS ANALYSED FOR DOMESTIC PURPOSES.

There can be no doubt, from the observation already made, that a pure and highly soft water must prove a great boon to a large population; but there are other data than those of saving soap and time, and of obtaining better-washed and whiter linen which deserve consideration,—I mean the preparation and manufacture of beverages. It is well known that soft water will better extract the flavor of tea; in fact, in many families rain water is employed for this purpose. The use of rain water is, however, attended with a serious evil, namely, that it becomes charged with a sufficient amount of compounds of lead to prove a slow poison, owing to the rapidity with which it attacks the leaden vessels in which it is generally stored. I have myself noticed two or three instances of this.

The nature of the hardness of a water may influence its adaption to the preparation of tea; for example, if a water like Loudscales falls in degree of hardness from 12 to 2 on boiling it for half an hour, it is easy to understand that, after such a purification, it will be a much better water than one posessing a permanent degree of hardness equal to 12. Still, the Loudscales water cannot be considered as good as those on the north side of Longridge Hill and Cowley Brook, which are perfectly neutral, as the tannic acid, or astringent principle which exists in tea, is rapidly acted on by the oxygen of the atmosphere, when under the influence of a fluid presenting an alkaline reaction. It has further been remarked at Greenwich, that a much stronger infusion of tea may be obtained by using a soft water than the permanently hard one of that town.

Some persons remedy the bad influence of hard water by adding carbonate of soda; this practice cannot, however, be too highly condemned. I have ascertained that the use of water containing a large proportion of carbonate of lime, as that of Loudscales, is also a disadvantage in brewing, as the extract of malt and hops acquires a dark color when prepared with such waters; in fact, it would be impossible to prepare with them a fine pale Indian ale.

There is no doubt that certain vegetables will cook a little quicker in soft water, such as that of Cowley Brook, than in one like Loudscales, and in that still better than the reservoir water, as it is known that waters containing gypsum are bad for culinary purposes; for the gypsum combines with the proteic substances existing in the vegetables, and forms with them an insoluble compound; so preventing the free access of the hot water to the internal part of the vegetable. Beans demonstrate this fact in a most remarkable manner.

ACTION OF THE WATERS ON LEAD.

The action of the five waters on lead piping has also drawn my attention. I cannot give a satisfactory explanation of the curious results I have obtained, as they are in contradiction to facts which I and other chemists have published; for the two purest waters, Cowley Brook and north side of Longridge Hill, act with extreme slowness on lead. In fact, samples of these waters, after having been left two months in contact with perfectly cleansed lead piping, contained only a very small amount of lead; whilst Dutton Brook, a water nearly as pure as the two above mentioned, contained a much larger amount. It is known that lead is rapidly attacked by pure waters, as rain or distilled waters, even when the latter has been boiled to expel any trace of air or carbonic acid it may contain. The action of the waters from Cowley Brook and Longridge Hill on lead piping cannot be ascribed to the presence of carbonic acid, as they only contain a usual proportion of that gas. To settle this question, lead was put in contact with distilled water partly charged with carbonic acid; but although the lead was much less acted on than by another portion of the same water not containing this gas, still it contained more lead than samples of the waters from Cowley Brook and north side of Longridge Hill. Although the action of water on lead has drawn the attention of the most learned chemists. viz., Chevreul, Christason, Graham, &c., the subject is far from being exhausted. Dutton Brook, Service-reservoir water, and Loudscales water, have nearly the same action on lead; but although they act slowly, still they are much more active than the two first waters examined.

The following are the results I have obtained:—

1.—After twenty-four hours contact, none of the waters contained an appreciable quantity of lead.

2.—After three days' contact,

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Cowley Brook, North side of Longridge Fell,	Traces.
Dutton Brook, Loudscales, Service-Reservoir,	Sufficient quantity of lead to assume a brown tinge with sulphuretted hydrogen.

3.—After two months' contact,

Cowley Brook, North side of Longridge Fell,	Assume a brown color, with sulphuretted hydrogen.
Dutton Brook, Loudscales, Service-Reservoir,	Become quite brown and turbid from sulphuret of lead.

APPLICATION OF THE WATERS TO MANUFACTURES.

The supply of pure water to manufactures is of high importance at the present time, particularly when we consider the immense amount of steam power in active operation. If a water contains a large proportion of carbonate of lime, as the Loudscales, not only does it tend to increase the number of those violent explosions which are too often witnessed, but it also throws a very serious and additional expense on the manufacturer, as he has often to stop the working of his engine to facilitate the removal of the deposit or incrustation which has been produced on the sides of his boiler. The removal of this is generally attended with injury to the boiler, either by false blows, or by the action of the hydrochloric acid sometimes made use of for that purpose. It is true that, to prevent such incrustations, a great number of methods have been devised; one only, however, has been effectually employed, viz., the introduction of sal-ammoniac or hydrochlorate of ammonia. This means is rather expensive; for a boiler of 20-horse power will require one pound of this salt per diem, and sal-ammoniac is worth at the present time, 36s. to 38s. per cwt.

Why employ such means, or have recourse to such methods, when you have pure water at your disposal?

These remarks will apply with still more force to the present service-reservoir water, which contains gypsum, against the incrustation of which there is no effectual remedy; and as the composition of this water often changes, being apt to contain carbonate as well as sulphate of lime, the quantity of deposit in the boilers will vary accordingly.

I have, I hope, sufficiently proved the deleterious effects of calcareous waters, in all works where soap is employed, and where calico printing and dyeing are carried on. There is only one kind of dyeing in which they have been found advantageous, viz., that of black on cotton fabrics and silks.

I would strongly recommend that all the service-pipes should be coated with the oil and carbonized tar of Mr. Mc.Dougall, which appears to give very satisfactory results in Manchester. The motive for recommending this coating is, that without such precaution the water soon corrodes the pipes and becomes highly charged with iron salts, which render it unfit for dyeing with madder, and a variety of other drugs; they are also a serious evil in wet weaving, and may produce iron stains in bleaching and washing linen.

ON THE INFLUENCE OF DIFFERENT SALTS EXISTING IN WATER ON THE HUMAN SYSTEM.

Salts of Lime.

Sulphate of Lime, or gypsum, must be considered as a useless salt in water, when it exists in an ordinary proportion; but when in a large amount it acts as a slight purgative on persons not in the habit of drinking selenic waters. This fact is well demonstrated by the waters of Paris.

Bicarbonate of Lime, or Chalk, plus Carbonic Acid, if in a moderate proportion, is most beneficial? for it has been demonstrated by Bousingault and Dupasquier that it is the only salt absorbed, and therefore contributes to the formation of bones. It is easy to understand why. The gastric juice contains free phosphoric acid, acid phosphates, and lactates of lime, which are capable, as Liebig has so ably shown, to take up with facility different proportions of lime, and still remain soluble, and beside, the free phosphoric acid of the juice, will dissolve the lime of the carbonate; whilst neither it nor the above-mentioned salts have any action on the sulphate of lime, nitrate of lime, or chloride of calcium. I would therefore propose that Cowley Brook water should be mixed with that from the north side of Longridge Hill, so as to increase the carbonate of lime to a sufficient amount.

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Salts of Magnesia.

There can be no doubt that, when a water contains a rather large amount of salts of magnesia, principally the sulphate, as is the case in a great number of the Lancashire waters, it must prove slightly injurious. It has also been found by Mr. Granges, that in all districts where the waters contain no salt of lime, but salt of magnesia, they appear to have a tendency to create scrofulous diseases I believe, however, that none of the water examined in this paper contain sufficient salts of magnesia to produce this effect: more so, as there is present preponderating proportions of salts of lime.

Salts of Iron.

A moderate proportion of salts of iron in water is highly beneficial to the health of persons living in large towns, especially to those in sedentary employments, as these salts are powerful stimulents and tonics, and are given by medical men to persons suffering from lymphatic or chlorotic diseases. In this point of view, all the waters examined in this paper contain a sufficient amount to recommend their use.

Salts of Potash.

As to the action of these salts, and those of soda, on the human frame, little is known. None of the waters analysed contain unusually large amounts of them.

In conclusion, gentlemen, I should suggest the employ of the waters from Cowley Brook, north side of Longridge Hill, and of those springs of Dutton Brook which are marked B, C, D, H.

I have the honor to remain, gentlemen,
Your obedient servant,
F. CRACE CALVERT, F. C. S.
Professor of Chemistry at the Royal Institution, and Royal Medical School of Manchester, Corresponding Member of the Academy of Turin, &c.
Manchester, March 1st, 1852.

LETTER FROM GENERAL BOARD.

THE GENERAL BOARD OF HEALTH,
WHITEHALL,
8th May, 1852.

Sir,

I am directed by the General Board of Health to transmit to you, for the information of your Local Board, copy of the report which has been laid before the General Board by Mr. Austin, on the examination which he was directed to make on the subject of the Supply of Water to the Borough of Preston.

I am to acquaint you that the General Board, on full consideration of the facts contained in this report, fully agree in the conclusion which is there set forth, that the supply of water furnished to the borough by the Preston Water Company is not 'proper,' in the sense of this term in the Public Health Act; and they would therefore recommend that before proceeding to other measures for the purpose of securing to the inhabitants a superior supply of water, the Local Board should, in accordance with the 75th section of the Act, take the necessary steps for proceeding to Arbitration upon this point, when the information and evidence now adduced as to the objectionable quality of the present supply, and the remarkable purity of that which appears to be so readily attainable, will, of course, be made available in seeking a decision on the subject.

I have the honor to be, Sir,
Your obedient Servant,
HENRY AUSTIN,
Secretary.

HENRY WRIGG, Esq.,
Local Board of Health, Preston.

HŒMATOLOGICAL RESEARCHES.

BY M. LECANU.

THE experiments detailed in this Memoir which I have the honor of laying before the Academy, have for their object: the determination of the origin of fibrine; the search for a means of freeing the globules of the serous liquid which holds them in suspension in the living blood; the analysis of the blood globules, in the state of purity. The following are the principal results.

1. When, having received directly into a saturated solution of sulphate of soda at the temperature of 54°F. the blood issuing from the vein of a man, an ox or a sheep, the mixture in which the globules are preserved intact is filtered through paper, the filter retains these globules, whilst it allows a slightly yellowish salino-serous liquid to pass through, capable of retaining its limpidness until putrefaction deprives it of it.

But, if it be diluted with seven or eight times its volume of water, it soon becomes a trembling mass, exactly similar to apple-jelly, which, placed on a cloth, abandons a liquid charged with albumen, is converted into a sort of glaire, and finally after it has been compressed, it leaves in the cloth colorless fibrine, translucid and somewhat pearly.

The globules washed in saline water, on the contrary, do not furnish any. From this experiment, which may easily be re-

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peated at all times and in all places, on masses of blood which enable us to fill earthen pans, and to obtain, in a single operation, several grammes of fibrine,—I think I may draw the following conclusions:—

The fibrine of blood spontaneously coagulated or beaten up, its analogues, inflammatory scum, the false membranes of croup, &c., arise excusively from the liquid portion of the blood in circulation:

The globules of blood, spontaneously coagulated or beaten up, represent, without modification of composition, the red corpuscules of the living blood of the superior animals: in its turn, the serum of both, plus fibrine, represents the liquid portion:

The apparition of the inflammatory scum, in certain pathological conditions, may coincide with the presence, in the blood, of a normal proportion of fibrine, provided that the quantity of water in it has augmented in a certain proportion.

2. Prolonged washings, suitably performed in water charged with sulphate of soda, free the blood globules from the serous liquid which had held them in suspension during life, and afterwards impregnated them like sponges, free them from it, I say, to such a degree that the washing liquors not only cease to become turbid at the boiling temperature, to be precipitated by nitric acid, bichloride of mercury or tannin, but also furnish, by evaporation, a residue which calcination does not blacken.

If we act with pure water, these globules, which had respected the saline solution, are almost immediately destroyed: the water passes through the filter of a blood red, charged with hæmatosin, with albuminous and other matters. From which it appears to me to result, for these globules, the proof of the existence of envelopes inpermeable to water charged with sulphate of soda, and by analogy, to the liquid part of the living blood; incapable, moreover, of being torn under the influence of these two liquids, as they are under that of pure water.

Independent constituent principles, and, perhaps, all different in their nature, from those which contain the liquid which held them in suspension.

3. The pure globules contain:

Extractive, fatty and saline matters and albumen in no way distinguished from that of the blood; globuline, a peculiar albuminous matter, which its solubility in boiling alcohol of 20°, and the property of forming with cold water a solution which does not render subacetate of lead turbid, distinguish from ordinary albumen, and which is found neither in serum nor in white of egg; a fibrinous matter, distinct from fibrine; its disposition in vesicles, or rather in small membranous sacs; its pearly aspect, resembling that of the blood globules agitated in the sun in saline water; its evident resistance to the solvent action of caustic alkalis, would lead to the idea that it is the true matter of the envelopes;—hœmatosin, or peculiar coloring principle, of which iron is one of the elements: it forms a little more than $\frac{2}{100}$ of the weight of the globules supposed in the dry state;—water. The presence of water in the globules of the blood, hitherto admitted by simple induction, and because it perfectly accounted for the incessant deformations which permit them to lend themselves to all the exigencies of the circulation, may be experimentally proved.

Indeed, from the moment when the water saturated with sulphate of soda permits the serosity which impregnates them without penetrating them to be removed without carrying off any of their own substance, it is perceived that the globules, if they contain in reality water of constitution, should, by desiccation, lose a quantity of water larger than that arising from the saline water with which they remained damp after the washing, and which will make known the weight of the sulphate of soda retained by the product of the desiccation, from which water removes it.

On the average, the globules of the blood of the ox contain one-third of their weight of water.

The water, the albumen, and the extractive, fatty and saline matters which are met with in them, should constitute, in the interior of the globules, a true serum, hydrating, liquifying perhaps their hœmatosin and their globuline, so that they might be represented as so many little bubbles, the sides of which would hold in reason, with special principles, a portion of those which contain also the interior serum.

In confirming the anticipation of MM. Dumas and Prévost, according to whom in the blood, water would exist entire in the state of serum, this result dispels the serious objection which their process of analysis raised. To the indisputable facility of execution which had caused it to be adopted by most experimentalists, this process adds a precision which had on the contrary been denied.

We should not, however, forget that the difference between the weight of the dry clot and the sum of the fixed matters of the serum, represents the weight of the materials special to the globules (hœmatosine,

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globuline), and not that of the globules themselves.

The annalysis of MM. Dumas, Prévost, Denis, Andral, Gavarret, Becquerel, Rodier, Lassaigne, Delafond, F. Simon,—and my own are therefore free from a cause of error which the important consequences derived from them by physicians and physiologists had rendered deeply to be regretted.

If these new experiments, this kind of anatomy of the blood, have solved some of the delicate and difficult questions which I have broached; if in demonstrating the justice of the data which have served as their basis, they do more still to develop the utility of the long and faithful works which I have alluded to, I shall esteem myself doubly happy in having undertaken them.—*Comptes Rendus*, No. 1, July 5, 1852.

COMPARATIVE INVESTIGATIONS ON THE IODINE AND OTHER MATTERS IN THE WATERS (AND SEWERS) WHICH SUPPLY PARIS, LONDON AND TURIN.

BY M. AD. CHATIN.

A.—THE waters of the Seine are, at a given time, more ioduretted near their source than in the neighborhood of Paris.

As the proportion of iodine diminishes, that of the other matters dissolved in the water increases although in a less proportion.

At Charenton the Seine is one of the rivers whose waters are at once the lightest and the richest in iodine.

MM. Boutron and O. Henry have mentioned the as yet imperfect mixture of the waters of the Seine with those of the Marne at their entry into Paris; this circumstance is the reason why the water is lighter and more ioduretted above the *Jardin des Plantes* and in the left arm which surrounds L'île Saint Louis than before L'île Louviet and the hydraulic wheel of the bridge of Notre Dame.

Below Paris, the waters of the Seine are but little more ioduretted than above; the mass of residue is, on the contrary, perceptibly increased. Here also, it is on the left shore that the water is the lightest by reason of the less importance of the sewers.

But that which chiefly distinguishes the waters of the Seine on leaving Paris, is less the quantity of matters dissolved than their quality. The proportion of organic matters and chlorides is perceptibly increased, and the salts of ammonia mentioned by M. Chevreul during the summer season, are here very appreciable; traces are likewise found of the sulphuretted hydrogen and urea brought by the sewers.

With the exception of the Yonne, the waters of which resemble those of the Haute Seine, all the tributaries of this river, tend, after leaving Montercan, to increase the amount of fixed substances and to lower the proportion of iodine.

The Essonne and Loing hold the first rank amongst these tributaries; then follow in succesion the Orge and Yvette, the Yéres, the Allamont and far behind all the Biévre which is at its mouth only a large drain with a base of water containing selenites.

By reason of the great volume of its waters, of the weight of earthy saline matters held in solution * of the small proportion of iodine, the frequent disturbances which for many uses, necessitate filtration or repose, the Marne should be considered the worst of the tributaries of the Seine. The Petit Morin and the Morin pour into the Marne waters which tend to increase the quantity of iodine.

The Orge, the Yvette, and above all the Allamont, the Yères and the Morin which descend from the most highly manured plains of Brie, often contain considerable quantities of extractive matters, nitrates and ammoniacal salts.

The products of the sewers vary considerably according to the hour of the day, the quarter traversed and the water furnished by the *bornes-fontaines*. The proportion of iodine may be once or twice, that of the residue from twice to ten times, that of the chlorides and extractive matters fifty times, more considerable than in the water of the Seine.

At the hours when, the *bornes-fontaines* being closed, the water of the sewers are in a state of greater concentration, there may be found in them traces of urate of ammonia, and in each quart some milligrammes of carbonate of ammonia, 1 to 2 decigrammes of phophates and as much as 1 gramme of urea and of the extractive matters of the urine.

After the deposition of the organic matters, the oxides and metallic sulphurets suspended in the water of the sewers, it is of a more of less amber color, of a sharp

* Contrary to the opinion of Dupasquier, I am far from admitting that water, to be salubrious should be charged with calcareous salts. My reasons are; 1st that the economy finds an ample supply of lime in other aliments; 2nd that iodine, of which nature is not so prodigal as of lime, is generally found in water in inverse proportion to the former.

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and salt flavor resembling that of urine, and almost always with the odor of urine.

When left for some days to themselves, the waters of the drains exhale an odor which is at once sulphurous and sharp to the eyes, due to the production of ammonia and hydrosulphuric acid. After a longer time the ammoniacal principle disappears almost entirely; the sulphurous element is then dominant and it might then be believed that it was one of the mineral waters found at various times in the radins of Paris.

After a heavy rain, the sewers carry into the Seine a considerable quantity of sulphate of lime removed from the city by the rain waters.

Of the tributaries to the canal of Ourcq, the river Ourcq, at Mareuil, is that which the nearest approaches the Seine in its lightness, its great amount of iodine, and the small quantity of organic matters.

Near to the Ourcq may be placed the Clignon (introduced into the canal in 1843, on the report of M. Thenard), which only differs perceptibly from it in the larger proportion of organic matters.

All the other water-courses which contribute to the canal have the effect of increasing the proportion of the sum of the matters dissolved and of diminishing that of the iodine. After the Ourcq and the Clignon comes the Gergogne, then successively: the Arneuse which has become saturated with organic matters in the marshes, the Thérouenne, the Beuvronne and the Collinance from which the Mory is not far removed, the Rutel whose waters are already very calcareous, and finally, the crude and selenitous springs from the rocks of Crégy.

On their arrival in Paris the waters of the canal of Ourcq contain about double the quantity of earthy salts, and half the iodine of those of the Seine before their mixture with the waters of the Marne.

The water of the artesian wells of Grenelle is sensibly ferruginous, as iodurette and lighter than that of the Seine taken even above the Marne.

The water of Arcueil contains clearly only one-fourth as much iodine as that of the Seine. As determined by MM. Boutron and Henry it continually deposits carbonate of lime, a little oxide of iron, etc., with which are precipitated traces of iodine.

The selenitous springs of the Prés Saint-Gervais contain from five to six times less iodine than the water of the Seine, and the proportion of this principle is still less in the waters of Belleville, which are distinguished from the other crude springs by their extreme crudity.

The wells of Paris, which are justly unused, furnish for the most part waters saturated with gypsum, charged with deliquescent chlorides and nitrates, and containing no appreciable quantity of iodine.

B.— The waters of the New River which are brought to London, where they are much esteemed and supply a great part of the city, especially the richest quarters, resemble very much, in their ioduration and lightness, the waters of the Seine.

At Windsor, or at Hampton Court, the waters of the Thames are in many respects like those of the canal of Ourcq, both as regards the proportion of iodine and that of the other matters in solution.

On leaving the city the waters of the Thames are charged with chlorides, organic matters and a little iodine.

The Old River taken at Feltham, near the iron bridge on the road to Hounslow, is perceptibly less iodurette than the Thames.

The New River should be counted, with the Seine, amongst the rivers which furnish the best potable water, the Thames and the Old River, as the canal of Ourcq, amongst those which are good and salubrious.

London possesses, at least in the lower part of Oxford Street, some pumps which give very light and iodurette water.

C. — The well waters generally used in Turin, are about half as selenitous as those of the wells of Paris, they resemble in the amount of principles in solution, our springs of the Prés-Saint-Gervais, but they contain only half as much iodine as even these last.

The springs Valentin and Saint Barbe which are very celebrated, especially the first, only really differ from the wells of Turin by containing even a smaller proportion of iodine.

The waters of the Po, principally used in Turin for washing establishments, contain half the quantity of earthy salts dissolved in the waters of the preceding springs, and a quantity of iodine clearly equal to that of the well-waters.

The waters of the Petite Doire are twice as selenitous as those of the Po; they are as much so as the springs Valentin and Sainte-Barbe at Turin, or as the waters of the Prés-Saint-Gervais; iodine is only found in very small quantity in them or not at all.

To sum up, whereas the principal waters which supply Paris and London resemble each other and are parallels, inasmuch as the Seine is represented by the New River, and the canal of Ourcq by the Thames, the potable waters of Turin can only be compared

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to our springs of the Prés-Saint-Gervais for the total weight of principles in solution, and with those of Belleville for the small quantity of iodine. — *Comptes Rendus*, No. 2 July 12, 1852.

RESEARCHES ON THE SULPHURETS DECOMPOSABLE BY WATER.

BY M. E. FREMY.

THE object of this work is to make known the production and the principal properties of a class of sulphurets hitherto very little examined, and the study of which is interesting to both chemistry and geology, because it must throw some light on the formation of mineral waters.

In looking at the action of water on the sulphurets, it is ascertained that these compounds may be divided into three classes. The first comprises the sulphurets of the alkalies and alkaline earths which dissolve in water; the second is formed by the insoluble sulphurets; the third consists of the sulphurets of boron, silicium, magnesium, and aluminium, which are decomposed by water: these latter sulphurets are scarcely known because their preparation has hitherto presented great difficulties.

The study of these bodies is, however, truly interesting, for the action which water exerts on them enables us to explain the principal phenomena which accompany the production of sulphurous springs.

In order to study in a complete manner all the questions connected with the decomposition of the sulphurets by water, I applied myself in the first place to find a method which should enable me with ease to prepare all the sulphurets: this method I now make known.

It is known that sulphur exerts no action on silica, boracic acid, magnesia and alumina; I thought that it would be possible to replace the oxygen in these bodies by sulphur by the intervention of a second affinity, like that of carbon, for the oxygen. These decompositions produced by two affinities, are frequent in chemistry; and in experiments, as yet unpublished, on the fluorides, I had already seen the sulphuret of carbon completely decompose the fluoride of calcium mixed with silica, producing sulphuret of calcium: I should therefore presume that the sulphuret of carbon, acting by its two elements on the preceding oxides, would remove the oxygen by means of the carbon which it contains and would at the same time form sulphurets: experiment has fulfilled this anticipation.

I have obtained, indeed, the sulphurets of boron, silicium, magnesium, and aluminium by subjecting to the action of sulphuret of carbon, under the influence of an elevated temperature, boracic acid, silica, magnesia, and alumina. To render this reaction more easy and to protect the sulphuret from the decomposing action of the alkalis contained in the porcelain tubes, it is sometimes useful to mix the oxides to be reduced with charcoal and to form balls like those which are employed in the preparation of chloride of silicium.

I ascertained by analysis that these sulphurets correspond to the oxides which have produced them.

I shall now say a few words concerning the sulphurets obtained by the method I have just made known.

The sulphuret of silicium had been produced in small quantity by Berzelius in the reaction of sulphur on silicium, and by M. Pierre in the decomposition of chloride of silicium by hydrosulphuric acid.

I have formed this body with the greatest facility by passing vapor of sulphuret of carbon over balls of charcoal and gelatinous silica placed in a porcelain tube and heated to bright redness. The sulphuret of silicium condenses in the tube and is then presented in fine white silky needles, which are not very volatile, but are easily carried off by vapors.

To show the interest attaching to the study of this body, it will suffice to mention here two of its reactions. When sulphuret of silicium is heated in a current of humid air, it is decomposed and forms silky crystals of anhydrous silica; it is evident that we may explain, by means of this experiment, the natural production of certain filamentous crystals of silica.

The sulphuret of silicium put in contact with water gives, as is known, a brisk disengagement of hydrosulphuric acid, and silica which remains entirely in solution in the water and is decomposed only when the liquor is evaporated; it is impossible not to connect this curious property of sulphuret of silicium with the natural circumstances in which certain mineral waters and some silicious incrustations are found.

As sulphuret of silicium is probably produced in all the cases in which silica is submitted to the double action of a binary compound, which yields it sulphur and at the same time takes its oxygen, this sulphuret is not so rare as has hitherto been supposed; and by admitting its presence in the soils which produce the sulphurous springs, we should explain the simultaneous existence of silica and hydrosulphuric acid in the principal sulphurous springs: this hypothe-

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sis is in some measure confirmed by the interesting observations of M. Descloizeaux which demonstrate that the silicious waters of the Geysers of Iceland contain a considerable quantity of hydrosulphuric acid.

I content myself with submitting these considerations to geologists, and with remarking to them that in explaining to them the formation of sulphurous and silicious waters by the decomposition of sulphuret of silicium, I do but give extension to the ingenious theory proposed by M. Dumas to account for the formation of boracic acid.

The sulphurets of boron and aluminium were produced like the sulphuret of silicium and are likewise decomposed by water.

I obtained sulphuret of magnesium by passing sulphuret of carbon over pure magnesia; in this case, the presence of charcoal does not appear to be useful: this sulphuret is crystallisable and soluble in cold water; when the solution is kept at the ordinary temperature it disengages hydrosulphuric acid only very slowly; but when it is boiled it produces a brisk effervescence of hydrosulphuric acid, depositing magnesia immediately.

Such is a summary of my first observations on the sulphurets decomposable by water, and which must, in my opinion perform a certain part in the production of mineral waters; I am persuaded that these compounds will be employed in future by chemists for forming new sulphurous bodies. I shall continue my experiments on this interesting class of sulphurets, and I will hasten to communicate to the academy the continuation of my work and the results I obtain which may appear to me worthy of its attention.

I consider it my duty here to acknowledge that in my researches on the sulphurets, I have been most zealously aided by a young chemist, M. Boutmy.—*Comptes Rendus*, No. 1, July 5, 1852.

EXTRACTION OF COPPER WITH AMMONIA.

BY M. GERMAIN BARRUEL.

An ore of copper, sulphuretted, pyritous, grey, however complex it may be, being given, to extract from it all the copper, and nothing but the copper, without roasting and leaving all the remainder of the ores:—this is the problem I set myself, for the benefit of the proprietor of a mine at Callee, in Algeria, which was thought to be carbonate of copper, but which was only grey copper covered with carbonate.

Guided by the great affinity of copper for oxygen in presence of ammonia, I at once tried the employment of this reagent; the success was complete. This ore reduced to powder, and placed with weak ammonia in a flask capable of containing, besides the quantity of air sufficient for furnishing to the copper all the oxygen necessary for its oxidation was agitated for a few seconds, and the flask being perfectly corked, the coloration of the ammonia was instantaneous, and the oxygen absorbed produced a vacuum, which was easily ascertained by reversing the flask and gently withdrawing the cork, for the air rushes in; the liquor, freed from the ammonia, leaves oxide of copper.

The problem was theoretically solved, but it was necessary to ascertain whether other metals, as zinc, cobalt, nickel and silver, which might be found with it, and whose oxides are likewise soluble in ammonia, would not act like copper. I then treated in the same manner natural sulphuretted and sulpho-arsenical combinations of these metals: there was no action. Only copper could therefore be extracted. To assure myself of the entire efficacy of the action, I treated the residue, which I supposed to be exhausted of copper, and I did not obtain a trace of red coloration with prussiate of potassa; and the problem was thus completely solved as a laboratory experiment.

Not being able, in so brief a note as this, to give the details of the difficulties which I have had to combat as regards the industrial application, I will only say that after having directly determined the proportion of ammonia necessary for the operation, I found that it required exactly 1 equivalent of ammonia to 1 of copper; as the oxidation is produced by a current of air slowly blown through the liquid in the midst of which the pulverised ore is maintained in suspension, I ascertained how much air was necessary for the result; I found that 1 kilogramme of copper requires 833 cubic decimetres of air.

The operation should not proceed too quickly, for, on the temperature increasing, a great part of the ammonia would be carried away. This inconvenience may be entirely avoided by means of an arrangement by which this ammonia is collected.

The cupro-ammoniacal solution separated from the rest of the ore, is submitted to a suitable distillation for collecting the ammonia and employing it for subsequent operations; the oxide of copper is then separated under the form of brilliant, black micaceous bracteæ, which are reduced and fused in order to obtain the metallic copper. I have thus succeeded completely by em-

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ploying directly, putrified urine, properly treated, but not distilled.

This process may be advantageously applied to assaying such minerals, and we thus obtain in a very short time all the copper under the form of button, by fusing the oxide with a little charcoal.

Having learned from M. Wurtz that the patents for England and America which I took out for this process, about two years ago, at the advice of M. Dumas, before whom I repeated the experiment, are about to be taken up, I have thought it right to communicate to the Academy this result of researches made with the view of preserving workmen and those living in the vicinity of copper-smelting works, from the dangers frequently resulting from the vapors produced by roasting. — *Comptes Rendus*, No. 1, July 5, 1852.

EXAMINATION OF A CYSTIC CALCULUS AND CYSTIC URINE.

BY M. J. MÜLLER.

M. Müller examined a cystic calculus extracted from the bladder of a boy aged 6½ years. The calculus weighed 268¾ grains. Its density was 1·58; its form was orvid, its color yellowish, its fracture confused cystalline.

A fragment of the inner part of this calculus was submitted to analysis. After having been pvlverised and dried on a sand-bath, it was digested in boiling water, which extracted the urate of ammonia. The residue was treated with hydrochloric acid, which dissolved all with the exception of a small quantity of uric acid. The acid solution was treated with carbonate of ammonia, and the liquor was evaporated to dryness; the ammoniacal salts were redissolved in water, and ammonia, poured on the residue, dissolved the cystine, leaving a small quantity of uric acid. On evaporating the ammoniacal solution to dryness, the cystine was obtained crystallised in small hexagonal tables.

The following are the results of this analysis of the cystic calculus:—

Urate of ammonia	26·25
Uric acid	2·50
Cystine	55·55
Ammoniaco-magnesian phosphate with traces of phosphate of lime	9·50
Water	7·50

The external part of the calculus contained less cystine than, and three times as much ammoniaco-magnesian phosphate as, the internal part.

The author analysed the urine of the patient before and after the operation.

Before the extraction of the calculus this urine was very alkaline and deposited an abundant sediment of mucous corpuscules, without uric acid and without phosphates. After the operation, the reaction of the urine was acid; it formed, as before, a mucous sediment, and contained less uric acid and phosphate than normal urine. After eight weeks, it began again to become alkaline; it was easy to demonstrate the presence of urea and chloride of sodium, but only traces of uric acid were detected. By repose it formed a sediment of ammoniaco-magnesian phosphate and cystine, easily isolated by meaus of acetic acid, which dissolves the earthy salt.

Thus the formation of cystine continued after the operation. The author thought that this substance which is naturally in soluble in water was held in solution by the phosphate of soda which the urine contains, and he proved that in the state of purity it is easily dissolved in this salt, as also in the pyrophosphate of soda; acetic acid precipitates it from this solution.

Soon after having analysed this calculus, the author had occasion to examine another still more voluminous, which had been extracted from the bladder of a man aged 73. It weighed 280·90 grains, and presented a central cavity containing a nucleus of the size of a Windsor bean, and weighing 39 grains. This nucleus was formed of pure cystine.—*Archiv. der Pharmacie.*

ON SOME ORES FROM THE SILVER MINES IN THE ENVIRONS OF COQUIMBO.—TWO NEW MINERALS.

BY M. DOMEYKO.

M. DOMEYKO, Professor of Chemistry at the College of Valparaiso, has addressed to the Ecole des Mines, a collection of ores from the silver mines of the environs of Coquimbo. In this interesting collection, are some crystals of iodide of silver of a form hitherto unknown, as well as two new minerals. M. Dufrenoy presented them to the Academy, according to the desire expressed by M. Domeyko.

The crystals of iodide of silver are 2 or 3 millimetres in length; they are in right rhomboidal prisms, with truncatures on the acute vertical angles; it results from this that their section has a symmetrical hexagon.

The two new minerals are:—

1. Antimoniate of mercury, from the mine of Jarilla, province of Coquimbo.

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2. Grey copper with antimoniate of mercury, from the same mine.

The grey copper is often mixed with antimoniate of mercury, visible to the eye; it is therefore probable that to this mixture is due the peculiar composition which it presents.

The analyses made by M. Domeyko lead him to admit, for the composition of the antimoniate of mercury, the following elements:—

Antimonic acid	0·338
Oxide of mercury	0·222
Oxide of copper	0·154
Oxide of iron	0·007
Gangue, pyrites, grey copper	0·110
Water and loss,	0·169

—*Comptes Rendus*, No. 2, July 12, 1852.

RESEARCHES ON GALLIC FERMENTATION.

BY M. DOBIQUET.

THE author presents, in the following terms, the summary of the researches which form the subject of his Memoir:—

Nut galls contain, besides tannin and various principles already noticed by chemists, pectose and pectase. This latter ferment, which exists in them in the soluble and insoluble states, acts at once on the pectose and on the tannin, converting the first into pectine and the second into gallic acid. The presence of water, and a temperature of 77°F. to 86°F., are necessary to this reaction, which is in all points similar to the ordinary phenomena of fermentation.

The ordinary ethereal tannin contains sufficient pectase to be converted spontaneously, in the presence of water, into gallic acid; but if care be taken to purify or simply to boil its solutions for a few minutes, the metamorphosis is not effected.

Synaptose, the ferment of beer, vegetable albumen, and legumine have a very doubtful action on tannin, and rather retard than accelerate its conversion into gallic acid.

It is quite as easy to convert the pectine of fruits into pectic acid by means of the pectase extracted from galls, as to convert tannin into gallic acid with pectase separated from the juice of new roots, and in particular from the roots of turnip.

The whole of the phenomena observed in my memoir may be designated under the name of *gallic fermentation;* but it must not be forgotten that the latter is compounded with pectic fermentation.

The syrupy liquid which has been obtained in the preparation of tannin by M. Pelouz's method, must not be regarded as a tannic ether, but simply as a juxta-position of water, tannin and ether in very variable and by no means definite proportions. For this species of association to be accomplished, it is necessary to realise one of the two following conditions: the nut galls are exposed to moisture sufficiently long for the tannin to be directly hydrated, and then to lixiviate with anhydrous ether; or to employ washed sulphuric ether containing sufficient water to arrive at the same results.—*Comptes Rendus*, No. 1, July 5, 1852.

CONTRIBUTIONS TO THE HISTORY OF ARSENIOUS ACID AND THE ARSENITES.

BY M. KUHN.

AFTER some observations on the crystalline form of arsenious acid, which sometimes crystallises in right rhomboidal prisms, isomorphous to those of native oxide of antimony, the author communicates some analytical data concerning the composition of the arsenites.

When a boiling solution of arsenious acid is added to a concentrated solution of nitrate of perfectly neutral nitrate of silver, the liquid turns yellow, becomes turbid, and deposits a small quantity of a pulverulent yellow precipitate. It is sufficient to add to the liquor a trace of ammonia to obtain an abundant yellow precipitate of arsenite of silver. The addition of a greater quantity of ammonia does not cause the formation of a more abundant precipitate; for the arsenite of silver is soluble in nitrate of ammonia.

This arsenite of silver contains—

$$3AgO, AsO^3$$

The arsenite of silver is dissolved with facility in ammonia. It is insoluble in potassa but arsenite of potassa dissolves it. Nitric acid dissolves it and oxidises it with the aid of ebullition. There are gradually separated from the liquor a white body and a brown mass, and when ammonia is poured into the boiled liquor arsenite of silver is precipitated from it.

Arsenite of lead may be obtained by treating acetate of lead by a boiling solution of arsenious acid. A thick white precipitate is formed, which, washed in water and dried, fuses, when heated, into a transparent glass, disengaging a little arsenic. This salt contains 51·19 per cent. of oxide of lead, which corresponds to the formula,

$$PbO, AsO^3.$$

When subacetate of lead is precipitated

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by a boiling solution of arsenious acid, another combination is obtained. It is a tribasic salt containing 72·16 per cent. of lead and 5·79 per cent. of water. Its composition is expressed by the formula—

$$3PbO, AsO^3+3HO.$$

The author announces that independently of the foregoing salts, he has obtained tribasic arsenite of magnesia by another process than that of M. Stein. Arsenite of lime contains, according to him,

$$3CaO, AsO^3.$$

When vitreous arsenious acid is dissolved in concentrated potassa, and when alcohol of 80° C. is added, a dense, oleaginous liquor separates, which represents a concentrated aqueous solution of arsenite of potassa, forming a yellow precipitate with nitrate of silver, and containing—

$$3KO, As\ O^3.$$

—*Archiv. der Pharmacie.*

ANALYSIS OF THE URINE IN A CASE OF ANASARCA.

BY M. CHARLES NEUBAUER.

M. NEUBAUER examined the urine of a man affected with caries of the bones of the foot and with pulmonary tubercles. This man died after anasarca. His urine was brownish, acid, and of the density of 1·011. It contained :—

	In 20 gr.	In 100 gr.
Water	19·470	97·350
Phosphate of lime, Phosphate of magnesia, Sulphates	0·015	0·075
Albumen	0·150	0·750
Extractive matter, Urea (traces), Uric acid, Ammoniacal salts, Mucus	0·356	1·825
	19·991	100·00

It is evident that this urine contained only traces of urea and uric acid. The author made the determination of these materials twice and never obtained more than imponderable traces of urea and uric acid. This is the striking result of his analysis.—*Archiv. der Pharmacie.*

ON THE COMPOUNDS OF COTTON WITH THE ALKALIES.

BY J. H. GLADSTONE, PH. D.

THE beautiful effects produced by Mr. Mercer through treating cotton with a cold solution of caustic soda, are well known, not only to the scientific world, but, through the medium of the Great Exhibition, to the public in general. Yet I believe the chemical compound itself has not hitherto been investigated.

This gentleman found that when cotton, or a cotton fabric is immersed in a very strong alkaline ley in the cold, a certain combination is effected. This "sodaed" cotton parts with all its alkali when washed with pure water, and the "mercerised" cotton thus produced, is not only much contracted, so that coarse fabrics have assumed the appearance of fine ones, but when dyed it displays colors of more than ordinary brilliancy.

It is evident that by the process described above, the combination of soda and lignine, is not obtained in a state fit for analysis. As the fabric issues from the alkaline ley, there adheres to it an excess of soda, and the moment it is touched by water its integrity is destroyed. It became a desideratum then to find a solvent capable of removing the uncombined alkali whilst it left the compound unimpaired. Alcohol suggests itself to mymind as likely to possess the requisite quality, especially as it might be employed in an anhydrous condition. As preliminary experiments, two portions of pure cotton were taken each weighing 20grs. when thoroughly dried. The one was steeped in cold caustic soda, so dilute as not to produce Mr. Mercer's reaction, the other in a strong solution of soda. They were both soaked repeatedly in successive portions of absolute alcohol, and subsequently dried in vacuo over sulphuric acid. In Exp. I. the cotton proved to be of its original weight, and did not retain any soda; in Exp. II. the cotton had increased to 24·4 grs., and contained an amount of soda, which when dissolved out by water, neutralized by sulphuric acid, and evaporated in a platinum dish (excess of sulphuric acid in combination being removed as usual by small pieces of carbonate of ammonia), gave 4·8 grs. of sulphate=2.1 grs. of absolute soda. From the first experiment, the conclusion may be drawn that absolute alcohol is capable of removing from cotton any portions of uncombined soda; and from the second it may be inferred that such alcohol does not decompose the compound of soda and cotton.

Having thus obtained a method, I performed a series of more exact experiments. A solution of soda of sp. gr. 1124 was found capable of combining with cotton, though it did not produce much shrinking. It was made use of in preference to a stronger solution, as it left less alkali adhering to the the fibre to be afterwards washed out with alcohol.

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Exp. III. 20 grs. of cotton steeped for an hour in the alkaline ley, washed repeatedly with absolute alcohol, and thoroughly dried in vacuo, had increased to 21·97 grs., and furnished 27·0 grs. of sulphate of soda.

Exp. IV. The cotton regained from Exp. II., similarly treated, showed an increase of weight to 21·09 grs., and yielded 2·71 grs. of sulphate of soda.

Exp. V. 20 grs. of cotton were treated in precisely the same manner, but as the difficulty of washing out the uncombined soda consumed much absolute alcohol, ordinary rectified spirits was employed instead. The soda compound weighed 21·28 grs., and yielded 2·05 grs. of sulphate of soda.

Exp. VI. 20 grs. of cotton similarly treated, were washed with hot alcohol of sp. gr. 825. The dried compound weighed 22·20 grs., and yielded 3·12 grs. of sulphate. This is a large amount, and indicates that alcohol of this strength may safely be employed to wash the compound.

Exp. VII. Lest it might be contended that the alcohol did not remove from the woody fibre certain impurities, which might be present in an aqueous solution of soda, 20 grs. of cotton were steeped in a clear but saturated alcoholic solution of the alkali. Little if any shrinking took place, but there was a certain amount of combination, for the cotton well washed with spirits of sp. gr. 825 and dried, weighed 21·01 grs., and afforded 1·41 grs of sulphate of soda. As yet the results are very discordant, as will be apparent from the annexed table, nor does the combined soda in any instance stand in a definite atomic ratio to the lignin:

	Ratio between original and soda-ed cotton			and combined soda.
Exp. III.	100	:	109·85	: 5·91
,, IV.	100	:	105·45*	: 5·94
,, V.	100	:	106·4	: 4·49
,, VI.	100	:	111·0	: 6·83
,, VII.	100	:	105·05	: 3·08

* This number is reckoned as obtained from 20 grs.; but it is in all probability too low, since the whole amount of cotton, as will be afterwards explained, is never recovered from the mercerising process.

From this we must conclude either that woody fibre has a great affinity for caustic soda at a low temperature, but does not form any definite chemical compound with it; or else that the cotton in the foremention experiments had not been thoroughly saturated with the alkali. As this might depend upon the strength of the alkaline ley in which the immersion was made, a solution of soda of sp. gr. 1342 was employed, and gave much more satisfactory results.

Exp. VIII. 20 grs. of cotton, steeped in soda-solution of the above-mentioned specific gravity, and washed with successive portions of hot alcohol of sp. gr. 825, until when dried it ceased to lose weight, was found to have increased to 22·64 grs., and yielded 4·25 grs. of sulphate of soda.

Exp. IX. 20 grs. of previously mercerised cotton, similarly treated, showed an increase of weight to 23·21 grs. and yielded 4·70 grs. of sulphate.

Exp. X. A piece of calico 4 in. × 4, and weighing, when thoroughly dried, 18·65 grs., was subjected to the action of soda. From a solution of sp. gr. 1124 it absorbed an amount of soda equivalent to 2·00 grs. of sulphate; that is, as 100 : 4·70 combined soda. Washed with water, dried, again immersed in alkaline ley, but of sp. gr. 1342, washed with hot alcohol of sp. gr. 825, and dried in vacuo, it weighed 21·84 grs., and yielded 4·40 grs. of sulphate of soda. The immersion in soda only lasted 10 minutes. The piece of calico had contracted to the measure of 3·3 in. × 3·3.

Exp. XI. In order to ascertain whether the fibre was capable of combining with a still larger proportion of soda, either by employing a stronger alkaline ley, or by exposing it to the action for a longer period, a piece of calico weighing 18·32 grs. was immersed for 17 hours in a solution of caustic soda so strong as to be syrupy, in a vessel protected from the atmosphere. Having been washed and dried as usual, it weighed 21·04 grs., and yielded 3·78 grs. of sulphate of soda. This, instead of being a larger amount of soda than in three previous instances, is a trifle smaller. There was the same amount of contraction.

Exp. XII. was intended as one in which every precaution should be taken to insure the definite character of the compound examined. A piece of fine calico of about 90 strands to the inch, weighing 14·67 grs., and measuring 3 in. × 3, was steeped in cold caustic soda in a close vessel for 30 minutes. It was then removed, pressed between folds of cloth, and washed with absolute alcohol also in a vessel protected from the air, until it ceased to lose weight when dried. Dried in vacuo it weighed 17·17 grs., and it afforded 3·15 grs. of sulphate of soda.

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The results of these five experiments may be thus tabulated:

	Ratio between original and soda-ed cotton			and combined soda.
Exp. VIII.	100	:	113·2	: 9·31
„ IX.	100	:	116·05	: 10·30
„ X.	100	:	111·2	: 10·34
„ XI.	100	:	114·8	: 9·07
„ XII.	100	:	117·05	: 9·41

It will be at once evident that there is a wide discrepancy between the numbers in the first column, but the second column presents considerable accordance; and if we take the amount of soda in the experiment most to be relied on—No. XII., namely, 9·41 per cent, or the average of the whole five determinations,—namely, 9·68 per cent. we find it almost exactly coinciding with the amount that should be obtained, supposing one atom of soda to combine with one atom of lignine—C^{24} H^{20} O^{20}—namely, 9·65.

324 : 31·3 :: 100 : 9·65.

The mode of production of this substance might lead us to imagine that it was a substitution product of C^{24} H^{20} O^{20}, in which one equivalent of sodium replaced one equivalent of hydrogen; but, as the weight of the dried substance never fell short of the united weights of the cotton and the soda taken up, it must rather be considered as a compound of the two. The difference of its state of hydration clearly gives rise to the differences observable in the first column of the tables. In some instances (as Exp. X.) the soda appears to carry along with it little or no water, in other instances (as Exp. XII.) as large a quantity as 3 equivalents; and this combined water will not separate in vacuo at ordinary temperatures. The compound is also very hygroscopic, absorbing from moist air, in one observed instance, as much as 5·39 grs. of water for 23.21 grs. of "soda-ed" cotton, which however it parted with again in vacuo. When neutralizing with sulphuric acid the soda washed out from the cotton, I had frequently observed that there was no effervescence: this induced me to try whether the "soda-ed" cotton really did not absorb carbonic acid. Upon exposing a portion to an atmosphere of this gas, I found the alkali was converted into carbonate; and 20 grs. of cotton, which proved to be combined with 2·06 grs. of soda, weighed when dried in vacuo 23·71 grs. Little or no water could have been retained by the substance, for the weight of the cotton, plus that of the alkali considered as carbonate, would be 23·51 grs. There is a remarkable circumstance attending this compound in its relation to heat: it becomes scorched at a far lower temperature than the original cotton.

That the combination of the soda with the cotton has effected a permanent change upon it is certain; when regained it is contracted, and takes dye better; but the question arises: Is this merely a physical alteration, or has a real chemical change of the lignina taken place? I am inclined to view the "mercerised" cotton as chemically identical with the original substance. In the first place, it is of the same ultimate composition. It is true the cotton regained never absolutely equalled the original in weight; but it was always observed that the fibre lost some flocculent portions during the steeping and the washing processes, enough to account for the 1 or 1·5 per cent deficiency which usually occurred. The removal of only one equivalent of water would have occasioned a decrease of 2·78 per cent. Again, the mercerised cotton can be recombined with soda, causing even some additional shrinking by the process. Mixed nitric and sulphuric acids convert it into gun-cotton; it is acted upon by oil of vitriol just as ordinary lignine; and it is similarly hygroscopic.

The change that takes place in the physical condition of the cotton is best observed under the microscope. The fibres in their ordinary state appear as flattened twisted ribands; but the moment they are touched by the alkaline ley they untwist themselves, and contract in length, as they swell out, assuming a rounded solid form; and this circular appearance they retain after the soda is removed by water. Thus the shrinking is explained, and I think also the superior character of the colors which mercerised cotton is capable of exhibiting. For the substance of the fibre itself is of a porous nature, and will of course absorb a larger quantity of the dye when expanded, than when compressed into a flat twisted band, and as this takes place in the same space, a greater *intensity* of color must be the result.

From these observations it appears that lignine is capable of forming a combination with soda, the proportion of the alkali varying with the strength of the solution employed, but in no instance exceeding one atom, and that this compound is decomposed by water, being resolved into its original compounds.

In order to ascertain whether a similar

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potash compound existed, a piece of fine calico, measuring 3 in.×3, and weighing 14·50 grs., was immersed for thirty minutes in as strong a solution of potash as could be obtained limpid. It was washed with alcohol of sp. gr. 825, and dried and decomposed as usual. It shrank to the dimensions of 2·7 in.×2·7. When combined with potash it weighed 17·14 grs., and it yielded 3·83 grs. of sulphate of potash.

	Ratio between original and combined cotton	and potash.
Exp. XIII. . . .	100 : 118·2	: 14·27

This shows that there was one equivalent of potash taken up by the cotton, the compound being $C_{24}H_{20}O_{20}+KO$.

324 : 47·3 : : 100 : 14·59.

These compounds of the alkalies with lignine are clearly analogous to their known compounds with sugar. Brendecke and others have shown that both cane- and grape-sugar will combine with potash and soda in the proportion of 1 equivalent, C^{24} H^{20} O^{20}, to 1 equivalent of the alkali. Whether these compounds are decomposed by water does not appear from the recorded observations; for whether it be so or not, the same phenomena would be presented. Disregarding the varying amount of water combined with the lignine compounds, we find both them and the sugar compounds expressed by the formulæ:

$C^{24}H^{20}O^{20}$. KO, and $C^{24}H^{20}O^{20}$. NaO.

—*Quarterly Journal of the Chemical Society*, April 1st, 1852.

ON GUTTA PERCHA: ITS PROPERTIES, PROXIMATE ANALYSIS, ITS ELEMENTARY COMPOSITION AND ITS APPLICATIONS. *

BY M. PAYEN.

ALTHOUGH we do not possess any precise date concerning all the circumstances relative to the extraction of the product which comes to us from the Isles of Asia, under the name of gutta percha, it is known that this substance is contained in the descending sap of the *Isonandria percha*, of Hooker, Family of Sapotaceæ, genus *Bassia-Butyracea (Dodecandria Monogynia.)* This tree attains large dimensions: 1 metre in diameter and 20 metres in height: its wood, which is soft and fibrous, is valueless for building and works; its fruits furnish fat oil.

A tree cut down may give, it is said, 18 kilogrammes of gutta percha or solid gum. The juice dried in thin superposed layers, forms more or less thick irregular masses, of a rusty or greyish color, of which, since 1845, each year more considerable quantities have been sent into Europe and America.

For several centuries, the natives have employed gutta percha almost entirely for forming, by malaxating with heat, handles for hatchets, endowed, when cold, with a certain suppleness and very great resistance.

Now gutta percha is purified for numerous and useful applications, by dividing it by a sort of rasping in cold water, which removes, in great part, the soluble organic matters and salts, and facilitates the separation of some ligneous remains as well as earthy matters.

The purification is completed in tepid water in several vessels, it is afterwards dried and the product is agglomerated into a pasty mass, by heating to about 230° F., in a double boiler, heated by steam.

Gutta percha thus prepared becomes so soft as to be adhesive and easy to join; rolled into sheets or into straps of all thicknesses, drawn out into tubes of various diameters, moulded into all sorts of forms, it acquires after being slowly cooled, very great solidity and tenacity. However, it is important to observe that a small quantity

* Gutta Percha was, in 1849, the subject of a thesis by M. Adriani, of which M. Dumas has kindly informed me.

The author had then given the state of knowledge of the natural history of the product; he sought to determine its elementary composition as well as that of a resin which he had extracted from it and from Caoutchouc.

The results given in a table present very great differences among themselves relative to the composition of the same body; indeed, according to thirteen of these analyses gutta percha would contain in 100 parts, 0, 2, 5, 11, 12, 15, or 20. 5, of oxygen.

The resin would contain 9·5 or 12·7 of oxygen; as to caoutchouc, the analysis sometimes indicated no oxygen, and sometimes 7 or 11·5 per cent.

We can draw no conclusion from these analyses, which are difficult indeed.

M. Adriani adds besides that the small quantity of matter on which he operated, did not admit of his studying the proximate composition of gutta percha.

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of water interposed suffices for preventing adherence between its parts or for destroying the resistance of its joints.

PROPERTIES OF ORDINARY GUTTA PERCHA.

Gutta percha as purified in manufacture is of a red brown color; it electrises quickly by friction, and is a bad conductor of electricity and heat.

At the ordinary temperature of our climate, from 32 to 77° F., it is endowed with a tenacity nearly as strong as that of thick leathers and a little less flexibility; it softens and becomes perceptibly pasty at about 118° F., although still very consistent. Its ductility is so great that, at the temperatures of 113 to 140° F., it may easily be rolled into thin leaves, and drawn out into wires or tubes; its suppleness and its ductility diminish as the temperature lowers. Moulding, facilitated by heat and pressure, can reproduce the finest details and the polish of the moulds. It does not possess at any temperature that elastic extensibility which characterises caoutchouc. Exposed for an hour at 14° F., it retained its suppleness, which was a little diminished.

Under its different forms, gutta percha is endowed with a peculiar porosity; we may easily prove its remarkable disposition to take this porous structure in the following manner:—a drop of a solution in sulphuret of carbon is placed on a sheet of glass; spontaneous evaporation very soon reduces this solution to a whitish film; observed then under the microscope the numerous cavities in it may be clearly discerned. These cavities are rendered still more visible by means of a drop of water; the liquid insinuates itself, dilating the sides, and very soon the mass appears more opaque; under the microscope, the cavities appear enlarged.

Analogous results are obtained by keeping immersed in water fine sheets, obtained transparent by evaporation with heat, of a solution of gutta percha.

The foregoing observations led me to think that this substance, by virtue of its porosity, retaining a great number of small bubbles of air, owed to this interposition the appearance of a lower density than that of water, and that it was supposed to be equal to 0·979.

Indeed, by drawing out dry gutta percha under high pressure, and immediately cutting the strips thus obtained and plunged in water, most of the pieces fall to the bottom of the vessel: some immediately, the others after having absorbed a certain quantity of water. The same result is also obtained by keeping immersed for a month, in water deprived of air, very thin sheets prepared by different means: their pores gradually filling with liquid, they then become heavier than the water, and cease to float. Besides the gutta percha is so much the heavier as it has been longer exposed to the air, especially in thin layers.

The porous structure of gutta percha is changed into a fibrous structure by being drawn out to twice its length; then, having become very little extensible, it bears, without breaking, more than double the force employed for producing the first elongation.*

Ordinary gutta percha resists cold water, humidity, and the various influences which excite fermentations; but it may be softened, and undergo a sort of pasty superficial fusion, under the influence of the solar rays of summer.

It is not acted on by alkaline solutions, even when caustic and concentrated; ammonia, the various saline solutions, water charged with carbonic acid, the various vegetable and the dilute mineral acids, have no action on it; drinks containing a small quantity of alcohol (wine, cyder, beer) do not attack it; brandy itself dissolves mere traces of it. Olive oil does not appear to act on gutta percha without heat; it dissolves it in small proportion with heat, and allows it to precipitate again on cooling.

Sulphuric acid with one equivalent of water turns it brown and disaggregates it with perceptible disengagement of sulphurous acid.

Hydrochloric acid in saturated solution in water, at the temperature of 68° F., slowly attacks gutta percha and colors it of a more or less deep brown, and after a time renders it brittle.

Monohydrated nitric acid attacks it very violently, with effervescence and disengagement of vapors of hyponitric acid; the matter is disaggregated, is colored of a brown orange red, becomes pasty, then solidifies by degrees and remains friable.

* A very thin strip, 20 centimetres long, 3·6c. broad, and 0·03mm. thick, submitted to a graduated drawing out, by means of weights added by 10 grammes at a time, was lengthened to 43 centimetres under the weight of 1098 grammes; the elongation was only one-half: 43+22=65, with nearly double the weight=2098. Rupture took place under the weight of 2128 grammes, after a further elongation of 1 centimetre, in twice; the contraction was 4·5c. The temperature of the air was at 66° F. during this experiment.

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Without heat, and even with, only a portion (0.15 to 0.22) of gutta-percha can be dissolved in anhydrous alcohol and ether.

Benzine and essence of turpentine partially dissolve it without heat, but almost entirely with heat.

Sulphuret of carbon and chloroform dissolves gutta percha without heat; the solutions may be filtered under a very close bell glass, which prevents evaporation; the filter retains the foreign matters colored of a reddish brown, whilst the solution passes through limpid and almost colorless.

The filtered liquid, exposed to the air in a saucer, disengages the solvent, and deposits the white gutta percha in a more or less thick layer, which contracts in proportion as the interposed liquid is volatilised.

Except the color, which has disappeared, the gutta percha then presents the above indicated characters and properties of the commercial article. Submitted to a gradually raised temperature, it softens, fuses and then enters into ebullition without being sensibly colored: the diaphanous liquid gives abundant vapors condensable into an almost colorless oily liquid.

The last portions distilled are colored of a brown-orange; a carbonaceous deposit remains adhering in thin layer to the sides of the vessel.

PROXIMATE ANALYSIS.

We have said that alcohol and ether can dissolve only a portion of gutta percha; it is because this substance, as we announced in our first memoir (see THE CHEMIST, New Series, Vol. III, 1851-2, p. 241) is indeed composed of three proximate principles, whose separation required very delicate observations, although, from several of their properties, they were very clearly distinct.

If gutta-percha in thin sheets be put in contact without heat, with from fifteen to twenty times its bulk of anhydrous alcohol, and then slowly raise the temperature to boiling (172° F.), maintained for several hours in close vessels, the liquid filtered boiling and left in a closed flask will commence, in from 12 to 24 or 36 hours, to deposit on the sides of the vessel, and up to the level of the solution, white opaline granules, distant from each other, and some grouped; this gradually increases during several days.

These granules, attentively examined under the microscope, affect the forms of spherules truncated by the sides of the vessel. Their surface is smooth, or bristled with small, diaphanous, lamellar, elongated crystals. A few superficial fissures seem to indicate that these spherules are formed of a sort of yellowish diaphanous nucleus, covered by a white pellicle.

Such is really their singular crystalline structure, of which perhaps no other example is known; indeed, anhydrous alcohol dissolves witout heat all the subjacent, yellow, spheroidal substance, whilst the superficial pellicles, in the interior of which the alcohol, less dense, is substituted for the solid globule, appear then whiter and less translucid.

The alcoholic solution which has deposited during several days this species of complex spheroidal crystallisation, may again remove with heat a portion of the two proximate principles remaining in the substance, and allow a new quantity to crystallise by cooling. This extraction is finished by renewing several times the addition of alcohol to the gutta-percha, until nothing more is dissolved.

The solid substance which has resisted the action of the solvent is endowed, with the exception of some modifications, with the principal properties of crude gutta-percha; we shall here designate it under the name of *pure gutta*, or gutta. As to the other two organic principles one is a *yellow resin* much more soluble in alcohol without heat than the other, the *white crystalline resin*.

We profit by these differences of solubility to arrive with time and patience, at the complete purification of the three proximate principles.

The separation may also be effected by treating finely divided gutta-percha with ether without heat, which dissolves the mixture of the two resins; they are afterwards separated from each other by the above mentioned alcoholic treatments.*

The tendency of the white resin to constitute groups of irradiate lamellæ is manifested in a very remarkable circumstance, which is easily reproduced: some narrow strips, cut from a thin sheet of ordinary brown gutta percha are placed in a tube and immersed in anhydrous alcohol, the tube is closed and left thus.

After twenty or thirty days, a few whitish points appear here and there on the slips, and then on the sides of the tube. These points, which gradually become more bulky, are formed of crystalline tufts of the white resin.

Thus this principle is separated directly

* If we act with ether on very thin leaves, making a sort of percolator by means of a full tube, the decanted liquid carries away, with the two resins, a certain quantity of pure gutta.

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and without heat, even when the atmospheric temperature gradually rises, when, for example, we operate in spring or early in the summer.

The white crystalline resin, completely purified by alcoholic washings, then redissolved in anhydrous alcohol, is deposited, by slow spontaneous evaporation, in the air, in irradiate lamellar crystals, sometimes forming tufts symmetrically arranged in stars, and then presenting the appearance of a sort of inflorescence.

DISTINCTIVE CHARACTERS AND PROPERTIES OF THE THREE PROXIMATE PRINCIPLES WHICH CONSTITUTE ORDINARY GUTTA PERCHA.

The most abundant of these three principles which forms at least from 75 to 82 per cent. of the whole mass, is the pure gutta which presents the principal properties of the commercial product; it is white, translucid at 212° F., which joins in all its parts, opaque or demi-translucid cold, when it acquires the structure which determines an interposition of air or of a liquid endowed with a different refraction from its own. This structure appears still more distinct than in the natural substance containing the three proximate principles.

In thin sheets and at the temperature of 50 to 86° F., it is supple, extensible and not very elastic; at 122° F., it softens and becomes more and more adhesive and translucid in proportion as the temperature increases, undergoing a sort of pasty fusion, which becomes more perfect at from 212 to 230° F. Heated further, it fuses, enters into ebullition, and distils, giving a pyrogenous oil and carburetted gases.

Pure gutta, like the other two proximate principles, is electrised very quickly by friction and is a bad conductor of heat; ordinarily, it floats on water, but it sinks to the bottom when its pores are filled with that liquid.

It is insoluble in alcohol and in ether; almost entirely insoluble in benzine at 32° F., it is soluble at 77° F., and the solubility increases with the temperature. The solution saturated at 86° F., becomes a demi-transparent mass if cooled below Zero; alcohol precipitates pure gutta from its solution in benzine.

At 32° F. essence of turpentine dissolves very little gutta, whilst with heat, it disaggregates and readily dissolves it.

Chloroform and sulphuret of carbon dissolve pure gutta.

When we have extracted, by means of ether, the two resins interposed in the thin sheets of white gutta percha, leaving the last ether which impregnates them to be evaporated in the open air, these sheets, enclosed in a flask had undergone, after two months, at the temperature of 68 to 82° F., an alteration which appeared to depend on their porosity, on the action of the air, and perhaps on some ether retained in their pores.

Be it as it may, these sheets had then acquired new properties; they were brittle; exhaled a very distinct pungent odor; put in contact with an excess of anhydrous ether, they were partially dissolved, the soluble portion, obtained by evaporating the ether and desiccation at 194° F., was glutinous and translucid; it became opaque and hard by cooling to 14° F.

The portion not dissolved by the ether, put in contact with sulphuret of carbon, was rapidly penetrated with it, swelled up very much, became supple, transparent, dissolving only partially, and retaining its acquired volume, which was four times as great as before this immersion.

The sulphuret of carbon, renewed three times in six days, evaporated each time, after two days' contact, left as a residue a white and supple sheet.

The undissolved portion, swelled up, and diaphanous, left in the sulphuret of carbon for ten days, did not seem to be changed in state.

This sort of spontaneous transformation would perhaps become complete if it were continued longer; its profound study would require much time; it might lead to the discovery of the causes of certain changes observed fn small common objects in gutta percha. I have already found that thin layers exposed to the sun in damp air for eight days, are discolored, and that their substance has become, in great part, soluble in ether.

Monohydrated sulphuric acid, colors brown, attacks and slowly disaggregates pure gutta, disengaging sulphurous acid; after eight days' contact, the very deep brown liquid, diluted with water, becomes turbid and precipitates flocks of brown matter.

Monohydrated nitric acid attacks pure gutta with a vivid effervescence and disengagement of orange vapors of hyponitric acid.

Hydrochloric acid, in saturated solution, gradually attacks the gutta in thin sheets, and colors it of a deep brown; at the end of ten days, it becomes friable; diluted in the yellow liquid, leaves in the same state the brown lamellæ. The reaction of hydrochloric acid establishes one more distinctive characteristic between this proximate principle and the other two.

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CRYSTALLINE WHITE RESIN.

Obtained pure by means of the above described operations, it is presented as a light pulverulent mass, of opaque appearance, which, under the microscope, shows transparent lamellar crystals.

From 32° to 212°, it undergoes no perceptible change; its fusion commences at 160° F.; from 347 to 356° F., it acquires an oleiform fluidity and complete diaphaneity without considerable coloration; it solidifies by cooling, undergoes a contraction which cracks it, remains transparent and rather more dense than water.

The crystallised resin is very soluble in essence of turpentine, benzine, sulphuret of carbon, ether and chloroform; the spontaneous evaporation of the last two solvents allows it to crystallise in long, narrow and fine pearly lamellæ, forming, by their radiation from common centres, separated groups.

Anhydrous alcohol dissolves it very abundantly at the temperature of 167°F., giving, on cooling, a crystallisation in groups of lamellæ which increase for several days; the cold solution, decanted after crystallisation and abandoned to spontaneous evaporation, allows similar crystallisations of more voluminous lamellæ to form.

These crystals are unattackable and difficultly moistened with cold or boiling water, or by hot or cold caustic alkaline solutions, ammonia, as well as by the various dilute acids.

Monohydrated sulphuric and nitric acids attack them violently, producing phenomena similar to those observed in their reaction on pure gutta.

Hydrochloric acid, on the contrary, does not act on the white resin. In many of its characters, it resembles the breane extracted by M. Scribe from the resin of icica; it would be worth while to submit these two proximate principles to a comparative study.

YELLOW RESIN.

This amorphous resin, of a citron yellow, diaphanous, or slightly orange, according to its thickness, is a little heavier than water; solid and even hard and brittle at 32°F., it becomes gradually more supple as the temperature is augmented; at 122° F., it undergoes a pasty fusion which enables it, in fifteen or twenty minutes, to recover its level: it is only from 212 to 230° F., that its liquidity is complete. Heated further, it may enter into ebullition, but then it undergoes by degrees a profound alteration, turns brown, disengages acid vapors and hydrocarbons.

This resin retains with force the alcohol which has dissolved it; it separates from it by heating to 212° F. in vacuo until the swelling up entirely ceases.

It is soluble without heat in alcohol, ether, benzine, essence of turpentine, sulphuret of carbon, and chloroform; all these liquids evaporated leave as a residue the amorphous resin.

The dilute acids, the concentrated alkalis and ammonia do not attack the yellow resin.

Monohydrated sulphuric and nitric acids attack it violently, producing phenomena analogous to those observed in their action on the other proximate principles. *

Hydrochloric acid even in saturated solution at 68° F., does not attack it.

But the most remarkable observation of this resin is its capability of forming in the circumstances which we have indicated these globuliform crystals covered with another resin in white pellicle, and presenting in their complex structure the appearance of opaline spherules.

CONCLUSIONS

It is evident that gutta percha, as it comes to us is composed besides other matters in small proportions † of their clearly characterised proximate principles:

In order to give an idea of their characteristic properties, I call *crystalbane* or *albane*, that which is easily obtained in white crystals, and fluavile, the third, which is yellow, perceptibly fluid and flows at a low temperature.

The commercial varieties which I have examined gave the following proportions.

Gutta.....	75 to	82
Albane.....	16	14
Fluavile.....	6	4
	100	100

In the second part of this memoir, I intend to indicate the elementary composition of these proximate principles and the principal applications of the normal substance.—*Comptes Rendus*, No. 4, July 26, 1852.

* The reaction of nitric acid, apparently similar on the three proximate principles, seems to be different on each of them if we wash the substance attacked, and then pour on an excess of dilute ammonia; we thus obtain with pure gutta a citron yellow solution with the crystallised white resin, a yellow solution, at the bottom of which the undissolved substance is deposited of an orange red color; with the yellow resin, a solution of a deep red orange color.

† Soluble and insoluble salts, nitrogenous organic matters, a fatty substance, an essential oil, a coloring matter and oxide of iron.

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II. CHEMICAL MANUFACTURES, PHOTOGRAPHY, AND AGRICULTURAL CHEMISTRY.

ON THE ADULTERATION OF DRAGON'S-BLOOD AND ON THE MEANS OF DETECTING IT.

BY A. POMMIER.

THE dragon's-blood now found in commerce is very frequently contaminated with common resin: some samples are even met with which are entirely made up and which contain only a resinous matter and a coloring substance.* The means employed for detecting these frauds are based simply on the examination of the physical properties of the product; and, as these exclusively external characters may often be deceptive, it may not be useless to make known a more practical and more accurate process for arriving at the same object.

Dragon's-blood, as is known, contains a coloring substance of a resinous nature; experiment has shown me that this red coloring matter dissolves in caustic potassa without alteration of color, whilst it takes a beautiful yellow tint with sulphuric acid; moreover, this resin is also soluble in alcohol, and the alcoholic tincture, which is of the color of blood, gives with neutral acetate of lead a brick-red precipitate. I likewise ascertained that the addition of a certain quantity of common resin gave to dragon's-blood different characters: thus sulphuric acid made it take a more or less brown tint, and potassa dissolved it with difficulty. Moreover, the resin may easily be recognised by boiling the suspected dragon's-blood with water; the liquor possesses in this case a distinct resinous odor and taste, whilst good dragon's-blood communicates to water only an earthy taste. These facts being well established, I now describe my own mode of testing.

I take about 1 gramme of the dragon's-blood to be examined, and I treat it with 10 grammes of alcohol at 33 degrees, the alcoholic solution is tested with neutral acetate of lead; another portion of this tincture is evaporated to dryness at a gentle heat, and the extract thus obtained is submitted to the action of potassa and sulphuric acid. The following are the results furnished by various samples of dragon's-blood on which I operated in this manner.

No. 1. *Dragon's-blood in Sticks.*—This dragon's-blood gave an aqueous decoction of an orange yellow color, becoming turbid by cooling, of an earthy taste and without odor.

Its alcoholic solution was of a blood-red, and neutral acetate of lead formed a brick-red precipitate in it.

The alcoholic extract, which was likewise of a blood-red, dissolved in potassa without alteration of color, and became yellow with sulphuric acid.

No. 2. *Dragon's-blood in mass, taken from the Warehouse.*—Water boiled with this dragon's-blood had an orange color, and became turbid on cooling.

The alcoholic tincture, of a blood-red color, formed a brick red precipitate with acetate of lead.

The extract dissolved in potassa and took a yellow tint with sulphuric acid.

No. 3. Dragon's-blood given by M. Guibourt, to serve as a point of comparison. This specimen furnished the same characters as No. 1, which it resembles, moreover, in its physical properties.

No. 4. *Dragon's-blood in tears*, from the *Pterocarpus Draco.*—This product gave with alcohol a solution which forms a violet-rose colored precipitate with acetate of lead.

The alcoholic extract was soluble in potassa, and became yellow with sulphuric acid.

No. 5. *Dragon's-blood in mass, containing Resin.*—This sample was taken in commerce. The aqueous decoction gave a perfectly transparent liquor, of a golden yellow, and with a very distinct resinous odor and taste.

The alcoholic tincture gave a greyish red precipitate with acetate of lead.

The extract of a crimson red, was difficult of solution in potassa, and turned brown with sulphuric acid.

No. 6. *False Dragon's-blood in Olives, taken in Commerce.*—Treatment by boiling water furnished a transparent liquor, of a straw color, and of very strong resinous

* The matters most frequently employed for coloring these false products are: red ochre, colcothar, ground brick, red santal and various other vegetable substances of low price.

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odor and taste.

The alcoholic solution was of a golden yellow; acetate of lead produced in it a fine yellow precipitate.

The extract, of an orange yellow, was scarcely soluble in potassa, and became black with sulphuric acid.

Wishing to verify the characters which various coloring matters added to the resin would present, I operated comparatively on some mixtures of this kind, and obtained the results which I now detail.

Red Santal and Resin.—The aqueous decoction was transparent, of a rust color, and possessed a very marked resinous odor and taste.

Alcoholic solution of a red color, giving with acetate of lead a precipitate of the color of wine leys.

Extract of a red tint, taking a vinous color with potassa, and becoming black with sulphuric acid.

Annatto and Resin.—Boiling water took in contact with this mixture a straw color, resinous odor and taste.

Alcoholic solution of an orange yellow, forming a yellow precipitate with acetate of lead.

Alcoholic extract of an orange red color, turning deep green with sulphuric acid; potassa had no action on it.

Brazil-wood and Resin.—The aqueous decoction had a rose-color, an odor and taste of resin.

Alcoholic solution of an orange color, giving a rose precipitate with acetate of lead.

Extract orange red, passing to gooseberry red with potassa, and turning brown with sulphuric acid.

Madder and Resin.—Aqueous liquor of a yellowish rose color, and of resinous odor and taste.

Alcoholic tincture of an orange color, forming a flesh colored precipitate with acetate of lead.

Extract red, passing to violet with potassa, and turning brown with sulphuric acid.

Orchil and Resin.—Boiling water was colored of a light violet, and took the odor and taste of the resin.

The alcoholic solution was of a bright wine red; acetate of lead produced in it a rose-colored precipitate.

The extract was of a blue color; potassa communicated to it a magnificent violet tint, and sulphuric acid blackened it.

Campeachy and Resin.—Aqueous decoction of a wine red, and of resinous odor and taste.

Alcoholic tincture, of an orange red color, forming with acetate of lead a greyish blue precipitate.

Extract of an orange red, which becomes violet blue with potassa and deep red with sulphuric acid.

Such are the experiments I have made; these experiments will enable us to recognise with the greatest facility the presence of a resin and of a foreign coloring matter in dragon's-blood which is suspected of being adulterated.*

In daily practice, a more prompt means may be employed for estimating, approximatively the value of a sample of dragon's-blood; it will be sufficient to treat a small quantity of this substance with potassa, and to add to it an excess of sulphuric acid; a sample of dragon's-blood will be so much the more valuable as it is soluble in potassa without change of tint, and as it takes with sulphuric acid a very pure yellow color. A change of color by potassa, a brown tint with sulphuric acid, would indicate the presence of foreign substances.

I must not conclude without tendering my thanks to M. Guibourt, who has been kind enough to place at my disposal specimens of dragon's-blood of certain origin; it was on one of these samples, indeed, that I verified the experiments which I had already made, and ascertained that the results obtained were of some value.—*Journal de Chimie Medicale*, July, 1852.

THE MANUFACTURE OF EMERY.

There are many who use emery every day, but who do not know where it comes from, or how it is manufactured for use. We have recent accounts of emery discoveries in Minesota, but nearly all that is used at present in the arts comes from Turkey, near ancient Smyrna. Dr. Lawrence Smith, the American geologist, made a discovery of a deposit of emery while residing in Smyrna, and he made an examination of the locality in 1847.

Dr. Smith having reported his discoveries to the Turkish government, a commission of inquiry was instituted, and the business soon assumed a mercantile form. The mo-

* The mineral substances, such as red ochre, red oxide of iron, ground brick, &c., will be detected with the greatest ease. It will suffice to treat the suspected dragon's-blood with ether, until the resinous matter is completely dissolved: thus will be obtained a residue the nature of which may be determined by means of hydrochloric acid, which will entirely dissolve the oxide of iron, whilst it will only partially attack the red ochre, and will not act on the ground brick.

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nopoly of the emery of Turkey was sold to a mercantile house in Smyrna, and since then the price has diminished in the market.

The mining of the emery is of the simplest character. The natural decomposition of the rock in which it occurs facilitates its extraction. The rock decomposes into an earth, in which the emery is found imbedded. The quantity procured under these circumstances is so great that it is rarely necessary to explore the rock. The earth in the neighbourhood of the block is almost always of a red color, and serves as an indication to those who are in search of the mineral. Sometimes, before beginning to excavate, the spots are sounded with an iron rod with a steel point, and when any resisttance is met with, the rod is rubbed in contact with the resisting body, and the effect produced on the point enables a practised eye to decide whether it as been done by emery or not. The blocks which are of a convenient size are transported in their natural state, but are frequently broken by large hammers; when they resist the action of the hammer, they are subjected to the action of fire for several hours, and on cooling they most commonly yield to blows. It sometimes happens that large masses are abandoned, from the impossibility of breaking them to pieces of a convenient size, as the transportation, either on camels or horses, requires that pieces shall not exceed 100 lbs. each in weight.

Emery appears to be a mechanical mixture of corundum and oxide of iron.

When reduced to a powder, it varies in color from dark grey to black. The color of its powder affords no indication of its commercial value. The powder examined under the microscope shows the distinct existence of two minerals, corundum and oxide of iron. Emery, when moistened, always affords a very strong argilaceous odor. Its hardness is its most important property in its application to the arts, and was ascertained by Mr. Smith in the following manner:—fragments were broken from the piece to be examined, and crushed in a diamond mortar with two or three blows of a hammer, then thrown into a sieve with 400 holes to the inch. The powder is then weighed, and the hardness tested with a circular piece of glass, about four inches in diameter, and a small agate mortar. The glass is first weighed, and placed on a piece of glazed paper; the pulverized emery is then thrown upon it at intervals, rubbing it against the glass with the bottom of the agate mortar. The emery is brushed off the glass from time to time with a feather, and when all the emery has been made to pass once over the glass, it was collected, and passed through the same operation three or four times. The glass was then weighed, again subjected to the same operation, the emery by this time being reduced to an impalpable powder. This series of operations is continued until the loss sustained by the glass is exceedingly small. The total loss in the glass is then noted, and when all the specimens of emery are submitted to this operation under the same circumstances, an exact idea of their relative hardness is obtained. The advantages of using glass and agate are, that the latter is sufficiently hard to crush the emery, and in a certain space of time to reduce it to such an impalpable state, that it has no longer any sensible effect on the glass; and, on the other hand, the glass is soft enough to lose during this time sufficient of its substance to allow of accurate comparative results. By this method, the best emery was found capable of wearing away about half of its weight of common French window-glass. The blue sapphire of Ceylon, pulverized and experimented with in this manner, wears away more than four-fifths of its weight. This furnished the standard of comparison.

In the ordinary process, the lumps of emery ore are broken up in the same manner as stone is for repairing Macadamised roads, and into lumps of similar size. These lumps are then crushed under stampers, such as are used for pounding metallic ores, driven by water or by steam power. It is supposed that the stampers leave the fragments more angular than they would be if they were ground under runners, a mode which is sometimes employed. The coarse powder is then sifted through sieves of wire cloth, which are generally cylindrical, like the bolting cylinders of corn-mills; but the sieves are covered with wire cloth, having in general about ninety to sixteen wires to the inch. No. 16 sieve gives emery of about the size of mustard-seed; and coarser fragments, extending nearly to the size of pepper-corns, are also occasionally prepared for the use of engineers. The sieves have sometimes as many as 120 wires in the inch; but the very fine sizes of emery are more commonly sifted through lawn sieves. The finest emery that is obtained from the manufacturers is that which floats in the atmosphere of the stamping-room, and is deposited on the beams and shelves, from which it is occasionally collected. The manufacturers rarely or never wash the emery; this is mostly done by the glass-workers, and such others as require a greater degree of precision than can be obtained by sifting.

Washing emery by hand is far too tedious

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for those who require very large quantities of emery, such as the manufacturers of plate-glass and some others, who generally adopt the following method:—Twelve or more cylinders of sheet copper, of the common height of about two feet, and varying from about 3, 5, 8, to 30 or 40 inches in diameter, are placed exactly level, and communicating at their upper edges, each to the next, by small troughs or channels; the largest vessels has also a waste-pipe near the top. At the commencement of the process, the cylinders are all filled to the brim with clean water; the pulverised emery is then churned up with abundance of water in another vessel, and allowed to run into the smallest or the 3-inch cylinder, through a tube opposite the gutter leading to the second cylinder. The water during its short passage across the 3-inch cylinder, deposits in that vessel such of the coarsest emery as will not bear suspension for that limited time; the particles next fine are deposited in the 5-inch cylinder, during the somewhat longer time the mixed steam takes in passing the brim of that vessel; and so on. Eventually the water forms a very languid eddy in the largest cylinder, and deposits therein the very fine particles that have remained in suspension till this period; and the water, lastly, escapes by the waste-pipe nearly or entirely free from emery. In this simple arrangement, time is also the measure of the particles respectively depoited in the manufacture to which the emery is applied. When the vessels are to a certain degree filled with emery, the process is stopped, the vessels are emptied, the emery is carefully dried and laid by, and the process is recommenced.

Emery paper is prepared by brushing the paper over with thin glue, and dusting the emery-powder over it from a sieve. There are about six degrees of coarseness. Sieves with thirty and ninety meshes per linear inch, are in general the coarsest and finest sizes employed. When used by artizans, the emery-paper is commonly wrapped around a file or a slip of wood, and applied just like a file, with or without oil, according to circumstances. The emery-paper cuts more smoothly with oil, but leaves the work dull.

Emery cloth only differs from emery-paper in the use of thin cotton cloth instead of paper, as the material upon which the emery is fixed by means of glue. The emery cloth when folded around a file, does not ply so readily to it as emery-paper, and is apt to unroll. Hence smiths, engineers, and others, prefer emery-paper and emery-sticks; but for household and other purposes, where the hand alone is used, the greater durability of the cloth is advantageous.

Emery-sticks are rods of board about 8 to 12 inches long, planed up square; or with one side rounded like a half-round file. Nails are driven into each end of the stick as temporary handles, they are then brushed over one at a time with thin glue, and dabbed at all parts in a heap of emery-powder, and knocked on one end to shake off the excess. Two coats of glue and emery are generally used. The emery sticks are much more economical than emery paper wrapped on a file, which is liable to be torn.

Emery-cake consists of emery mixed with a little beeswax, so as to constitute a solid lump, with which to dress the edges of buff and glaze wheels. The ingredients should be thoroughly incorporated by stirring the mixture whilst fluid, after which it is frequently poured into water, and thoroughly kneaded with the hands, and rolled into lumps before it has time to cool. The emery-cake is sometimes applied to the wheel whilst they are revolving; but the more usual course is, to stop the wheel, and rub in the emery cake by hand. It is afterwards smoothed down by the thumb.

Emery-paper or patent razor-strop paper, an article in which fine emery and glass are mixed with paper pulp, and made into sheets as in making ordinary paper; the emery and glass are said to constitute together 60 per cent. of the weight of the paper, which resembles drawing-paper, except that it has a delicate fawn color. The emery-paper is directed to be pasted or glued upon a piece of wood, and when rubbed with a little oil, to be used as a razor-strop.

In 1842, Mr. Henry Barclay, of England, took out a patent for a method of combining powdered emery into discs and laps of different kinds, suitable to grinding, cutting, and polishing glass, enamels, metals, and other hard substances. The process of manufacture is as follows:— Coarse emery-powder is mixed with about half its weight of pulverized Stourbridge loam and a little water or other liquid, to make a thick paste; this is pressed into a metallic mould by means of a screw-press, and after having been thoroughly dried, is baked or burned in a muffle or close receiver at a temperature considerably above a red heat and below the full white heat. In this case, the clay or alumica serves as a bond, and unites the particles very completely into a solid artificial emery-stone, which cuts very greedily, and yet seems hardly to suffer perceptible wear.

Superfine grinding emery is formed into wheels exactly in the same manner as the

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above, but the proportion of loam is then only one-fourth instead of one-half that of the emery. Those emery stones, which are of medium fineness, cut less quickly, but more smoothly than the above.

Flour-emery, when manufactured into artificial stones, requires no uniting substance, but the moistened powder is forced into the metal mould and fired; some portions of the alumina being sufficient to unite the whole. These fine wheels render the works submitted to them exceedingly smooth, but they do not produce a high polish on account of the comparative coarseness of the flour-emery.—*Scientific American.*

DIRECT METHOD OF OBTAINING POSITIVE PROOFS ON PAPER.

BY M. ADOLPHE MARTIN.

THE simplicity of the employment of iodised collodion as a sensitive layer, the rapidity with which it receives the luminous impression, and the fineness of the proof obtained, have turned all minds towards its exclusive employment. The methods which have hitherto been given relate especially to the obtaining of negatives, and, notwithstanding the remarkable results which have been arrived at, we cannot but remark the want of harmony and model of the proofs obtained as a last result by these methods.

Having been occupied for some time with this question I shall in a short time communicate to the Academy some improvements I have made. In the mean while I think I may render service to photography by communicating a process, which is as certain as it is easy, of obtaining positive proofs.

Collodion, as I employ it, is composed of an ethereal solution of gun cotton (obtained by treating 2 grammes of cotton with a mixture of 50 grammes of nitrate of potassa and 100 grammes of sulphuric acid; the cotton, well washed and well dried, is entirely soluble in a mixture of 10 volumes of ether and 1 volume of alcohol;) ether and alcohol are then added so that the finished solution is composed of 1 gramme of cotton, 120 grammes of ether and 60 grammes of alcohol; then is added about 1 gramme of nitrate of silver converted into iodide and dissolved in 20 grammes of alcohol by means of an alkaline iodide, but preferably iodide of ammonium.

The glass plate, endued in the ordinary manner with a thin layer of this solution, is, before it is dry, steeped in a bath composed of 1 part of distilled water, $\frac{1}{12}$ of nitrate of silver, and $\frac{1}{20}$ of nitric acid. The fixing takes place, as in the ordinary way, in a few seconds. The glass plate is then plunged into a bath of sulphate of protoxide of iron, then washed with care.

The image has remained negative until this moment; but, by plunging it into a bath of double cyanide of silver and potassium, it becomes positive and complete, if the picture has been taken in suitable conditions. It only remains to wash it, cover it with dextrine, and dry it, and then frame it on a back of black velvet.

The bath which I employ is the same as that of MM. de Ruolz and Elkington; it is diluted with only about 3 volumes of water. It is composed of 1 quart of water, 25 grammes of cyanide of potassium and 4 grammes of nitrate of silver.

I may remark, in conclusion, that this process always gives me proofs, and that these proofs are always positive. Their perfection depends alone on the due appreciation of the time of fixing.—*Comptes Rendus*, No. 1, July 5, 1852.

THE NEW PATENT LAW AMENDMENT ACT.

July, 1852.

(*Concluded from page* 511.)

XXVIII. Every specification to be filed in pursuance of the condition of any letters patent shall be filed in such office of the Court of Chancery as the Lord Chancellor shall from time to time appoint, and every provisional specification and complete specification left or filed at the office of the Commissioners on the application for any letters patent, shall forthwith after the grant of the letters patent, or if no letters patent be granted then immediately on the expiration of six months from the time of such application, be transferred to and kept in the said office appointed for filing specifications in Chancery; and in case reference is made to drawings in any specifications deposited or filed under this Act, an extra copy of such drawings shall be left with such specification.

XXIX. The Commissioners shall cause true copies of all specifications (other than provisional specifications), disclaimers, and memoranda of alterations filed under or in pursuance of this Act, and of all provisional specifications after the term of the provisional protection of the invention has expired, to be open to the inspection of the public at the office of the Commissioners, and at an office in Edinburgh and Dublin respectively, at all reasonable times, subject

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to such regulations as the Commissioners may direct; and the Commissioners shall cause a transcript of the said letters patent to be transmitted for enrolment in the Court of Chancery, Dublin, and shall cause the same to be enrolled therein, and the transcript, or exemplification, thenceforward shall have the like effect to all intents and purposes as if the original letters patent had been enrolled in the Court of Chancery in Dublin, and all parties shall have all their remedies by *scire facias* or otherwise, as if the letters patent had been granted to extend to Ireland only.

XXX. The Commissioners shall cause to be printed, published, and sold, at such prices, and in such manner as they may think fit, all specifications, disclaimers, and memoranda of alterations deposited or filed under this Act, and such specifications (not being provisional specifications,) disclaimers, and memoranda respectively shall be so printed and published as soon as conveniently may be after the filing thereof respectively, and all such provisional specifications shall be so printed and published as soon as conveniently may be after the expiration of the provisional protection obtained in respect thereof; and it shall be lawful for the Commissioners to present copies of all such publications to such public libraries and museums as they may think fit, and to allow the person depositing or filing any such specification, disclaimer, or memorandum of alteration, to have such number, not exceeding twenty-five, of the copies thereof so printed and published, without any payment for the same, as they may think fit.

XXXI. It shall be lawful for the Lord Chancellor and the Master of the rolls to direct the enrolment of specifications, disclaimers, and memoranda of alterations heretofore or hereafter enrolled or deposited at the Rolls Chapel-office, or at the Petty Bag-office, or at the Enrollment-office of the Court of Chancery, or in the custody of the Master of the Rolls as keeper of the public records, to be transferred to and kept in the office appointed for filing specifications in Chancery under this Act.

XXXII. The Commissioners shall cause indexes to all specifications, disclaimers, and memoranda of alterations heretofore or to be hereafter enrolled or deposited as last aforesaid to be prepared in such form as they may think fit, and such indexes shall be open to the inspection of the public at such place or places as the Commissioners shall appoint, and subject to the regulations to be made by the Commissioners, and the Commissioners may cause all or any of snch indexes, specifications, disclaimers, and memoranda of alterations to be printed, published, and sold in such manner and at such prices as the Commissioners may think fit.

XXXIII. Copies, printed by the printers to the Queen's Majesty, of specifications, disclaimers, and memoranda of alterations shall be admissible in evidence, and deemed and taken to be *primâ facie* evidence of the existence and contents of the documents to which they purport to relate in all courts and in all proceedings relating to letters patent.

XXXIV. There shall be kept at the office appointed for filing specifications in Chancery under this Act a book or books, to be called "The Register of Patents," wherein shall be entered and recorded in chronological order all letters patent granted under this Act, the deposit or filing of specifications, disclaimers, and memoranda of alterations filed in respect of such letters patent, all amendments in such letters patent and specifications, all confirmations and extensions of such letters patent, the expiry, vacating, or cancelling such letters patent, with the dates thereof respectively, and all other matters and things affecting the validity of such letters patent as the Commissioners may direct, and such register, or a copy thereof, shall be open at all convenient times to the inspection of the public, subject to such regulations as the Commissioners may make.

XXXV. There shall be kept at the office appointed for filing specifications in Chancery under this Act a book or books, entitled "The Register of Proprietors," wherein shall be entered, in such manner as the Commissioners shall direct, the assignment of any letters patent, or of any share or interest therein, any license under letters patent, and the district to which such license relates, with the name or names of any person having any share or interest in such letters patent or license, the date of his or their acquiring such letters patent, share, and interest, and any other matter or thing relating to or affecting the proprietorship in such letters patent or license; and a copy of any entry in such book, certified under such seal as may have been appointed, or as may be directed by the Lord Chancellor to be used in the said office, shall be given to any person requiring the same, on payment of the fees hereinafter provided; and such copies so certified shall be received in evidence in all courts and in all proceedings, and shall be *primâ facie* proof of the assignment of such letters patent, or share or interest

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therein, or of the license or proprietorship, as therein expressed: provided always, that until such entry shall have been made the grantee or grantees of the letters patent shall be deemed and taken to be the sole and exclusive proprietor or proprietors of such letters patent, and of all the licenses and privileges thereby given and granted; that certified duplicates of all entries made in the said register of proprietors shall forthwith be transmitted to the office of the Commissioners in Edinburgh and Dublin, where the same shall also be open to the inspection of the public; and any writ of *scire facias* to repeal such letters patent may be issued to the sheriff of the county or counties in which the grantee or grantees resided at the time when the said letters patent were granted; and in case such grantee or grantees do not reside in the United Kingdom, it shall be sufficient to file such writ in the Petty Bag-office, and serve notice thereof in writing at the last known residence or place of business of such grantee or grantees; and such register, or a copy, shall be open to the inspection of the public at the office of the Commissioners, subject to such regulations as the Commissioners may make: provided always, that in any proceeding in Scotland to repeal any letters patent, service of all writs and summonses shall be made according to the existing forms and practice; provided also, that the grantee or grantees of letters patent to be hereafter granted may assign the letters patent for England, Scotland, or Ireland respectively as effectually as if the letters patent had been originally granted to extend to England, or Scotland, or Ireland only, and the assignee or assignees shall have the same rights of action and remedies, and shall be subject to the like actions and suits as he or they should and would have had and been subject to upon the assignment of letters patent granted to England, Ireland, or Scotland before the passing of this Act.

XXXVI. Notwithstanding any proviso that may exist in former letters patent, it shall be lawful for a larger number than twelve persons hereafter to have a legal and beneficial interest in such letters patent.

XXXVII. If any person shall wilfully make, or cause to be made, any false entry in the said register of proprietors, or shall wilfully make or forge, or cause to be made or forged, any writing falsely purporting to be a copy of any entry in the said book, or shall produce or tender, or cause to be produced or tendered, in evidence any such writing, knowing the same to be false or forged, he shall be guilty of a misdemeanor, and shall be punished by fine and imprisonment accordingly.

XXXVIII. If any person shall deem himself aggrieved by any entry made under color of this Act in the said register of proprietors, it shall be lawful for such person to apply, by motion, to the Master of the Rolls, or to any of the courts of common law at Westminster in term time, or by summons to a judge of any of the said courts in vacation, for an order that such entry may be expunged, vacated, or varied, and upon any such application the Master of the Rolls, or such court or judge respectively, may make such order for expunging, vacating, or varying such entry, and as to the costs of such application, as to the said Master of the Rolls, or to such court or judge may seem fit; and the officer having the care and custody of such register, on the production to him of any such order for expunging, vacating, or varying any such entry, shall expunge, vacate, or vary the same, according to the requisitions of such order.

XXXIX. All the provisions of the Acts of the sessions holden in the fifth and sixth years of King William the Fourth, chapter eighty-three, and of the session holden in the seventh and eighth years of her Majesty, chapter sixty-nine, respectively, relating to disclaimers and memoranda of alterations in letters patent and specifications, except as hereinafter provided, shall be applicable and apply to any letters patent granted, and to any specifications filed under the provisions of this Act: provided always, that all applications for leave to enter a disclaimer or memorandum of alteration shall be made, and all caveats relating thereto shall be lodged at the office of the Commissioners, and shall be referred to the respective law officers in the said first-recited Act mentioned: provided also, that every such disclaimer or memorandum of alteration shall be filed in the office appointed for filing specifications in Chancery under this Act, with the specification to which the same relates, in lieu of being entered or filed, and enrolled as required by the said first-recited Act, or by the Act of the session holden in the twelfth and thirteenth years of her Majesty, chapter one hundred and nine, and the said Act shall be construed accordingly: provided also, that such filing of any disclaimer or memorandum of alteration, in pursuance of the leave of the law-officer in the first-recited Act mentioned, certified as therein mentioned, shall, except in cases of fraud, be conclusive as to the right of the party to enter such disclaimer or memorandum of alteration under the

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said Acts and this Act; and no objection shall be allowed to be made in any proceeding upon or touching such letters patent, specification, disclaimer, or memorandum of alteration, on the ground that the party entering such disclaimer or memorandum of alteration had not sufficient authority in that behalf: provided also, that no action shall have been brought upon any letters patent in which, or on the specification of which, any disclaimer or memorandum of alteration shall have been filed in respect of any infringement committed prior to the filing of such disclaimer or memorandum of alteration, unless the law-officer shall certify in his fiat that any such action may be brought, notwithstanding the entry or filing of such disclaimer or memorandum of alteration.

XL. All the provisions of the said Act of the fifth and sixth years of King William the Fourth, for the confirmation of any letters patent, and the grant of new letters patent, and all the provisions of the said Act, and of the Acts of the session holden in the second and third years of her Majesty, chapter sixty-seven, and of the session holden in the seventh and eighth years of her Majesty, chapter sixty-nine, respectively, relating to the prolongation of the term of letters patent, and to the grant of new letters patent for a further term, shall extend and apply to any letters patent granted under the provisions of this Act, and it shall be lawful for her Majesty to grant any new letters patent, as in the said Acts mentioned; and in the granting of any such new letters patent her Majesty's order in council shall be a sufficient warrant and authority for the sealing of any new letters patent, and for the insertion in such new letters patent of any restrictions, conditions, and provisions in the said order mentioned; and the Lord Chancellor on the receipt of the said order in council, shall cause letters patent, according to the tenor and effect of such order, to be made and sealed in the manner herein directed for letters patent issued under the warrant of the law-officer; provided always, that such new letters patent shall extend to and be available in and for such places as the original letters patent extended to and were available in: provided also, that such new letters patent shall be sealed and bear date as of the day after the expiration of the term of the original letters patent which may first expire.

XLI. In any action in any of her Majesty's superior courts of record at Westminster or in Dublin for the infringement of letters patent, the plaintiff shall deliver with his declaration particulars of the breaches complained of in the said action, and the defendant, on pleading thereto, shall deliver with his pleas, and the prosecutor in any proceedings by *scire facia*, to repeal letters patent shall deliver with his declaration, particulars of any objections on which he means to rely at the trial in support of the pleas in the said action or of the suggestions of the said declaration in the proceedings by *scire facias* respectively: and at the trial of such action or proceedings by *scire facias* no evidence shall be allowed to be given in support of any alleged infringement, or of any objection impeaching the validity of such letters patent which shall not be contained in the particulars delivered as aforesaid: provided always, that the place or places at, or in which, and in what manner the invention is alleged to have been used or published prior to the date of the letters patent shall be stated in such particulars: provided also, that it shall and may be lawful for any judge at chambers to allow such plaintiff or defendant, or prosecutor respectively to amend the particulars delivered as aforesaid, upon such terms as to such judge shall seem fit: provided also, that at the trial of any proceeding by *scire facias* to repeal letters patent, the defendant shall be entitled to begin and to give evidence in support of such letters patent, and in case evidence shall be adduced on the part of the prosecutor impeaching the validity of such letters patent, the defendant shall be entitled to the reply.

XLII. In any action in any of her Majesty's superior Courts of Record at Westminster and in Dublin for the infringement of letters patent, it shall be lawful for the Court in which such action is pending, if the Court be then sitting, or if the Court be not sitting, then for a judge of such Court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, and account, and the proceedings therein respectively, as to such Court or judge may seem fit.

XLIII. In taxing the costs in any action in any of her Majesty's superior Courts at Westminster or in Dublin commenced after the passing of this Act for infringing letters patent, regard shall be had to the particulars delivered in such action, and the plaintiff and defendant respectively shall not be allowed any costs in respect of any particular unless certified by the judge before whom the trial was had to have been proved by such plaintiff or

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defendant respectively, without regard to the general costs of the cause; and it shall be lawful for the judge before whom any such action shall be tried to certify on the record that the validity of the letters patent in the declaration mentioned came in question; and the record, with such certificate, being given in evidence in any suit or action for infringing the said letters patent, or in any proceeding by *scire facias* to repeal the letters patent, shall entitle the plaintiff in any such suit or action, or the defendent in such proceeding by *scire facias*, on obtaining a decree, decretal order, or final judgment, to his full costs, charges, and expenses, taxed as between attorney and client, unless the judge making such decree or order, or the judge trying such action or proceeding, shall certify that the plaintiff or defendant respectively ought not to have such full costs: provided always, that nothing herein contained shall affect the jurisdiction and forms of process of the Courts in Scotland in any action for the infringement of letters patent, or in any action or proceeding respecting letters patent hitherto competent to the said Courts: provided also, that when any proceedings shall require to be taken in Scotland to repeal any letters patent, such proceedings shall be taken in the form of an action of reduction at the instance of her Majesty's Advocate, or at the instance of any other party having interest with concurrence of her Majesty's Advocate, which concurrence Her Majesty's Advocate is authorised and empowered to give upon just cause shown only.

XLIV. There shall be paid in respect of letters patent applied for or issued as herein mentioned, the filing of specifications and disclaimers, certificates, entries, and searches, and other matters and things mentioned in the schedule to this Act, such fees as are mentioned in the said schedule; and there shall be paid unto and for the use of her Majesty, her heirs and successors, for or in respect of the warrants and certificates mentioned in the said schedule, or the vellum, parchment, or paper on which the same respectively are written, the stamp duties mentioned in the said schedule; and no other stamp duties shall be levied, or fees, except as hereinafter mentioned, taken in respect to such letters patent and specifications, and the matters and things in such schedule mentioned.

XLV. The stamp duties hereby granted shall be under the care and management of the Commissioners of Inland Revenue; and the several rules, regulations, provisions, penalties, clauses, and matters contained in any Act now or hereafter to be in force with reference to stamp duties shall be applicable thereto.

XLVI. The fees to be paid as aforesaid shall from time to time be paid into the receipt of the exchequer, and be carried to and made part of the consolidated fund of the United Kingdom.

XLVII. Provided always, that nothing herein contained shall prevent the payment as heretofore to the law-officers in cases of opposition to the granting of letters patent, and in cases of disclaimers and memoranda of alterations, of such fees as may be appointed by the Lord Chancellor and Master of the Rolls as the fees to be paid on the hearing of such oppositions, and in the case of disclaimers and memoranda of alterations respectively, or of such reasonable sums for office or other copies of documents in the office of the Commissioners, as the Commissioners may from time to time appoint to be paid for such copies, and the Lord Chancellor and Master of the Rolls, and the Commissioners, are hereby respectively authorized and empowered to appoint the fees to be so paid in respect of such oppositions, disclaimers, and memoranda of alterations respectively, and for such office or other copies.

XLVIII. It shall be lawful for the Commissioners of her Majesty's Treasury from time to time to allow such fees to the law-officers and their clerks (for duties under this Act in respect of which fees may not be payable to them under the provisions lastly hereinbefore contained) as the Lord Chancellor and Master of the Rolls may from time to time appoint, and to allow such salaries and payments to any clerks and officers to be appointed under this Act, and such additional salaries and payments to any other clerks and officers in respect of any additional duties imposed on them by this Act, as the said Commissioners of the Treasury may think fit.

XLIX. It shall be lawful for the Commissioners of her Majesty's Treasury to allow from time to time the necessary sums for providing offices under this Act, and for the fees, salaries, and payments allowed by them as aforesaid, and for defraying the current and incidental expenses of such office or offices; and the sums to be so allowed shall be paid out of such monies as may be provided by Parliament for that purpose.

L. And whereas divers persons by virtue of their offices or appointments are entitled to fees or charges payable in respect of letters patent as heretofore granted within the United Kingdom of Great Britain and Ireland, or have and derive in respect of such letters patent, or the procedure for the

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granting thereof, fees or other emoluments or advantages:

It shall be lawful for the said Commissioners of the Treasury to grant to any such persons who may sustain any loss of fees, emoluments, or advantages by reason of the passing of this Act, such compensation as, having regard to the tenure and nature of their respective offices and appointments, such Commissioners deem just and proper to be awarded; and all such compensations shall be paid out of such monies as may be provided by Parliament for that purpose: provided always, that in case any person to whom any yearly sum by way of compensation shall be awarded and paid shall, after the passing of this Act, be appointed to any office or place of emolument under the provisions of this Act, or in the public service, then and in every such case the amount of such yearly sum shall in every year be diminished by so much as the emoluments of such person for such year from such office or place shall amount to, and provision in that behalf shall be made in the award to him of such yearly sum.

LI. An account of all salaries, fees, allowances, sums, and compensations to be appointed, allowed, or granted under this Act shall, within fourteen days next after the same shall be so appointed, allowed, or granted respectively, be laid before both Houses of Parliament, if Parlament be then sitting, or if Parliament be not then sitting, then within fourteen days after the next meeting of Parliament.

LII. Letters patent may be granted in respect of applications made before the passing of this Act, in like manner and subject to the same provisions as if this Act had not been passed.

LIII. Where letters patent for England, or Scotland, or Ireland have been granted before the passing of this Act, or are in respect of any application made before the passing of this Act hereafter granted for any invention, letters patent for England, or Scotland, or Ireland may be granted for such invention in like manner as if this Act had not been passed: provided always, that in lieu of all the fees or payments and stamp duties now payable in respect of such letters patent or in or about obtaining a grant thereof, there shall be paid in respect of such letters patent for England, or Scotland, or Ireland, on the sealing of such respective letters patent, a sum equal to one-third part of the fees and stamp duties which would be payable according to the schedule to this Act in respect of letters patent issued for the United Kingdom under this Act, on or previously to the sealing of such letters patent; and at or before the expiration of the third year and the seventh year respectively of the term granted by such letters patent for England, or Scotland, or Ireland, sums equal to one-third part of the fees and stamp duties payable at the expiration of the third year and the seventh year respectivly of the term granted by letters patent issued for the United Kingdom under this Act; and the condition of such letters patent for England, or Scotland, or Ireland shall be varied accordingly; and such fees shall be paid to such persons as the Commissioners of her Majesty's Treasury shall appoint, and shall be carried to and form part of the said consolidated fund.

LIV. The several forms in the schedule to this Act may be used for and in respect of the several matters therein mentioned, and the commissioners may, where they think fit, vary such forms as occasion may require, and cause to be printed and circulated such other forms as the may think fit to be used for the purpose of this Act.

LV. In the construction of this Act the following expressions shall have the meanings hereby assigned to them, unless such meanings be repugnant to or inconsistent with the context; (that is to say,)

The expression "Lord Chancellor" shall mean the Lord Chancellor, or Lord Keeper of the Great Seal, or Lord Commissioners of the Great Seal.

The Expression "The Commissioners" shall mean the Commissioners for the time being acting in execution of this Act.

The expression "Law Officer" shall mean her Majesty's Attorney-general or Solicitor-general for the time being for England, or the Lord advocate, or her Majesty's Solicitor-general for the time being for Scotland, or her Majesty's Attorney-general or Solicitor-general for the time being for Ireland.

The Expression "Invention" shall mean any Manner of new Manufacture the Subject of Letters Patent and Grant of Privilege within the Meaning of the Act of the Twenty-first Year of the Reign of King James the First, Chapter Three.

The Expression "Petition," "Declaration," "Provisional Specification," "Warrant," and "Letters" respectively, shall mean Instruments in the Form and to the effect in the Schedule hereto annexed, subjet to such Alterations as may from Time to Time be made therein under the powers and Provisions of this Act.

LVI. In citing this Act in other Acts of Parliament, Instruments, and Proceedings, it shall be sufficient to use the expression "The Patent Law Amendment Act, 1852."

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LVII. This Act shall commence and take effect from the First Day of October One thousand eight hundred and fifty-two.

The SCHEDULE to which this Act refers.

Fees to be Paid.

	£	s.	d.
On leaving Petition for Grant of Letters Patent	5	0	0
On Notice of Intention to proceed with the Application	5	0	0
On sealing of Letters Patent	5	0	0
On filing Specification	5	0	0
At or before the Expiration of the Third Year	40	0	0
At or before the Expiration of the Seventh Year	80	0	0
On leaving Notice of Objections	2	0	0
Every Search and Inspection	0	1	0
Entry of Assignment or License	0	5	0
Certificate of Assignment to License	0	5	0
Filing Application for Disclaimer	5	0	0
Caveat against Disclaimer	2	0	0

Stamp Duties to be Paid.

	£	s.	d.
On Warrant of Law-officers for Letters Patent	5	0	0
On Certificate of Payment of the Fee payable at or before the Expiration of the Third Year.	10	0	0
On Certificate of Payment of the Fee payable at or before the Expiration of the Seventh Year	20	0	0

ABSTRACTS OF SPECIFICATIONS OF CHEMICAL PATENTS RECENTLY ENROLLED.*

Improvements in the preparation of certain compounds to be used for the purpose of rendering woven and textile fabrics, paper, leather, wood, or other materials or substances waterproof and fireproof, and also in machinery or apparatus employed therein. ROBERT BECK FROGGART, of Sale Moor, manufacturing chemist. Patent dated December 31, 1851.

1. The patentee prepares his compositions for waterproofing and fireproofing by combining in different proportions, according to the nature of the articles treated and the uses to which they are to be applied, the following chemical and other substances: First, graphite, prepared by burning 10 parts of iron filings with 90 parts of carbon for about 10 hours. Second, animal or vegetable matters, such as gluten, glue, gum, resin, mucus, or other similar substances dissolved in water. Third, blood, the serum of which is separated from the crassamentum by the application of gentle heat. Fourth, protosulphate of iron dissolved in water, or the basic red sulphate of iron, double sulphate of alumina and potash, or hydrochlorate of ammonia. Fifth, oxygenated oil or fatty matters. These ingredients are applied in various proportions to the substances to be treated. When pliability is not an object, the oil or fatty matters need not be used.

2. The patentee describes an arrangement of apparatus for impregnating fatty and oily matters with a stream of oxygen gas, and for separating their impurities.

Claims—1. The several combinations, compositions, or compounds of chemicals described for rendering woven and textile fabrics, and other articles or materials waterproof and fireproof, or waterproof, only.

2. The apparatus for impregnating oils or fatty substances with oxygenated gas, and for purifying such substances.

A new process for manufacturing paper. JEANE ANTOINE FARINA, of Paris. Patent dated January 13, 1852.

This invention consists in obtaining pulp for the manufacture of paper from the plant called "spartum," or "water broom."

The patentee takes the plants, and having separated the roots and the stems, he cuts the latter into pieces of from four to six inches long, which pieces he submits to the operation of barking or stripping. He then steeps them in water rendered alkaline with American or other potash, in the proportion of about 2 per cent. of the weight of stems operated on, and continues the steeping about four hours, during which time the temperature of the solution is raised by steam. As soon as the steeping is completed, and the material is cold, it is removed to a crushing mill, and is then washed in water acidulated with nitric or sulphuric or muriatic acid, after which it is corded, bleached (by liquid chlorine or the vapour evolved from cloride of lime, wetted with muriatic acid,) and again washed, when it is in a fit state to be used alone or mixed with cotton or linen pulp, according to the processes ordinarily followed in the manufacture of paper.

The roots of the plant may be treated in a similar way, only they are much harder than the stems, a greater quantity of potash will be required in the steeping process and of acid in the subsequent washing; and the bleaching process will also occupy a longer

* Collected from *The Mechanic's Mag.*

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time. It is to be observed, however, that the pulp produced from the roots will not in any case be so white as that from the stems.

Claims.—1. The preparation of pulp from the plant called "spartum," or "water-broom," for the manufacture of paper, by means of the operations described.

2. The employment of American or other potash in the preparation of pulp from "spartum."

Improvements in the manufacture of gas for the purposes of illumination, and of improvements in the purification of gas, and of improved modes of treating the products arising from the manufacture of gas. GEORGE LOWE, of Finsbury Circus, civil engineer, and FREDERICK JOHN EVANS, of Horseferry Road, Westminster, civil engineer. Patent dated January 20, 1852.

The words of the title printed in Roman characters have been disclaimed by the patentees.

The *first* part of the invention consists in increasing the illuminating power of certain gases by combining them with carburetted hydrogen in the retorts in which the same is generated. The carburetted hydrogen is produced from cannel coal, coal, lignite, pitch, tar, oil, resin, retinite, and other substances, which are distilled in suitable retorts, into which the gases whose illuminating power is to be increased are introduced whilst these matters are undergoing the process of distillation. The gases to be treated in this manner may be obtained from wood, sawdust, dried tanners'-bark, or other similar materials. The gases from inferior qualities of coal, and from peat, will also be suitable for being similarly treated, as also carbonic oxide gas. This latter may be obtained by passing carbonic acid through a retort containing coke at a white or red heat. The waste gases from furnaces may also be combined with carburetted hydrogen, either after having been passed through retorts containing coke at a red or white heat, or directly on issuing from the furnace.

The *second* part of the invention, which has relation to the purification of gas from sulphuretted hydrogen, consists in the use for that purpose of a certain material hitherto supposed by chemists to be a ferrate of potash, but which is, in reality, peroxide of iron in a peculiar state; and also of sulphite or bisulphite of lead.

The method of preparing the first-mentioned material is as follows:—the patentees take any kind of peroxide of iron and calcine it with caustic potash or soda. The compound thus produced is then decomposed by diffusing it in water, when the caustic soda or potash used is separated, and remains in solution, from which it may be eecovered, and the peroxide of iron is precipitated in a fit state for use. Or they mix with peroxide of iron and caustic soda a small portion of common salt, and proceed as before. Or they heat the common peroxide of iron to a temperature of about 600° Fahr., and thus render it capaple of purifying gas, though previously inert. Or they treat in the same way such ochres or ferruginous earths as will, after calcination, become black on being submitted to a stream of sulphuretted hydrogen. The prepared peroxide of iron may be mixed with sawdust, slightly moistened, and used in the same way as lime in what is known as the dry-lime purification process. Or it may be diffused through water, and used as in the wet lime process. In the former case, the material may be revivified by exposing it to the air. In the latter it can also be recovered for repeated use, by separating it by filtration, drying, and then exposing it to the air.

The sulphite or bisulphite of lead is used in the manner practised in lime purification. By calcining the spent materials, sulphurous acid may be obtained which can be employed in producing fresh sulphite or bisulphite, or converted to sulphuric acid, while the residue, after calcination, by careful roasting, may be converted to litharge.

Claims.—1. The combining of gases which possess different degrees of illuminating power by the introduction of gas obtained in any of the ways described, into retorts, or vessels, containing carbonaceous matter under distillation.

2. The use of anhydrous peroxide of iron, also of sulphite and bisulphite of lead for the removal of sulphuretted hydrogen from coal gas.

Improvements in the manufacture of candles. HENRY GRAHAM WILLIAM WAGSTAFF, of Bethnal-green, candle-maker. Patent dated January 20, 1852.

Mr. Wagstaff's improvements are as follows:—

1. In addition to the matters with which candlewicks are usually saturated to assist their conbustion, he applies a small quantity of gelatinous material to give stiffness to the wick, and then passes the same between heated rollers, by which the wick is dried and brought to a proper shape for use.

5. He takes two, three, or four plaited wicks, and having passed them in a state of

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tension into a vessel containing melted wax or fatty materials, he brings them into contact, and withdraws them from the vessel through a narrow aperture in the side of the vessel, and then through a refrigerator, by which means the wicks are cooled and caused to adhere to each other, but, when burning, are enabled to separate sufficiently to turn out of the flame of the candle in which they have been used.

3. He winds the wick for dip candles on a reel of peculiar construction, which he sets in revolution over a vessel containing melted fatty maters, and, by causing the lower part of the reel to dip in the fatty matters, all the wicks upon it are coated at a single revolution. They are then strung on rods, and dipped in the usual way.

4. For moulding candles having two or more wicks, he uses an arrangement of mould frame in which the moulds are set in continuous rows in an incline position, the same wick passing through all the moulds in a row. The wicks are sustained in their positions in the moulds by being passed over weighted rocking flops, situated in the spaces between the ends of the rows of moulds.

Claims.—1. The modes of treating or preparing plaited candlewicks, and also the apparatus described for carrying out such modes of treatment.

2. The mode of manufacturing candles having two or more wicks, and the means of sustaining the wicks in the candle-moulds or mould-pipes.

Improvements in manufacturing and purifying certain gases, and in preparing certain substances for purifying the same. FRANK CLARK HILLS, Patent dated January 22, 1852.

The improvements for manufacturing gas have relation to that produced by decomposing steam with the vapour of coal-tar, and consists of several processes and arrangements of apparatus for this purpose.

The improvements in purifying gas consist in using for that purpose muriate of lime, or magnesia mixed with lime, or magnesia, or both, the process being performed as in dry-lime purification.

The improvements in preparing substances for purifying gas consists in renovating carbonate of lime and of magnesia for such purposes, by expelling their carbonic acid by the aid of heat, and in using continuously the subsulphate and oxichloride of iron, and such oxides of iron as are suitable for purifying gas, by supplying with the gas to be purified a volume of atmospheric sufficient to reoxidize the spent purifying materials.

An improved lubricating compound, JOHN DENNISON, of the firm of JOHN DENNISON and SON, of Halifax, York, and DAVID PEEL, of the same place, manufacturers. Patent dated February 9, 1852.

The patentees commence their specification by observing that in the preparation of wool, rag-wool, and flocks for spinning into yarns, it is necessary and usual to lubricate the same either after they have been washed and scoured, or while in their primitive state sometimes termed "blending" with oil (commonly gallipoli, olive, rape, or whale oil), in order to lay and smoothen the fibres, and thereby facilitate the subsequent operations of teazing, scribbling, slubbing, and spinning; and that the expenditure for such lubrication adds largely but unequally to the cost of manufacturing woollen yarns (the coarser and least valuable sorts of wool, rag-wool, and flocks, requiring the largest quantities of oil), and is, in all cases, more or less burdensome. They then proceed to state that the nature of their invention consists in the manufacture of a new lubricating compound which may be advantageously substituted for the oil so presently used in the preparation of wool, rag-wool, and flocks; not only costing much less, but serving the purpose better, and which new compound may also be applied in most other cases where a cheap, effectual, and innocuous means of lubrication is desirable. The manner of manufacturing the said new lubricating compound, is as follows: The patentees take a quantity of sea-weed, and boil it to a jelly in water. The quantity of water used should be just about sufficient to produce four gallons of jelly from every pound weight of sea-weed (for the sea-weed, kelp prepared therefrom, or barilla, may be substituted, but they prefer to use the sea-weed itself). They then draw off the jelly, leaving the refuse matters behind, and add to it, while yet warm, gallipoli, olive, rape, whale, or some other oil of like properties, in the proportion of from one-fourth to three-fourth parts of oil to each part of jelly, mixing the jelly and oil thoroughly by any convenient mechanical means. They thus obtain, at about less than one-half the cost of the oil, a compound which is possessed of much more valuable properties; for not only are the wool, rag-wool, or flocks, when treated with this compound, easier to scribble or spin than when blended with oil, but the yarns, when made into warps, do not require to go through the ordinary process of sizing, owing, no doubt, to the glutinous quality imparted to the material by the new compound, and are

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ultimately stronger and better, producing, of course, a superior description of cloth. The proportions of the oil and jelly to one another may, as has been stated, vary from one to three-fourth parts of jelly to each part of oil; that is to say, any combination of the materials within these limits, or thereabouts will be useful for lubricating purposes; and the patentees do not restrict themselves to any specific proportions. But they may observe that, according to their experience, the best proportion (for the woollen manufacture, at least) is one part of the jelly for every part of oil.

Claim.—The preparation of a compound for lubricating purposes, consisting partly of oil and partly of the jelly obtained as aforesaid, in the proportions before specified, or any other suitable proportions.

Improvements in the manufacture of magnesia and some of its salts. THOMAS RICHARDSON, of Newcastle-upon-TYNE. Patent dated January 23, 1852.

The *first* branch of this invention consists in the manufacture of magnesia and the carbonate thereof from magnesian limestone, by the employment of muriatic acid. The quantity of acid used should be slightly in excess of the exact quantity required to dissolve out the lime in the limestone operated on. This may either be burnt to expel the carbonic acid and then slacked in pits previous to adding the muriatic acid, or it may be employed in the natural state reduced to an impalpable powder,—the product in the former case being magnesia, and in the latter an impure carbonate; which may either be employed as such, or be deprived of its carbonic acid by the application of heat. The acid employed by the patentee is (by preference) the weak muriatic acid, which is at present allowed to run to waste in alkali works, and the proportions of its use are, a quantity containing about 37 parts of pure muriatic acid to every 28 parts of lime in the burnt magnesian limestone, and the same for every fifty parts of carbonate of lime in the unburnt stone.

The *second* part of the invention has relation to the employment of magnesia, obtained as aforesaid, in the manufacture of some of the salts thereof.

1. In order to increase the production of what are known as "rough epsoms" in the alum trade, the patentee proposes to use magnesia freed of lime by muriatic acid, as aforesaid, instead of the magnesian limestone ordinarily used.

2. In order to produce sulphate of magnesia when manufacturing alum, the patentee adds to the alum liquors (which always contain an excess of acid) a sufficient quantity of magnesia obtained as aforesaid, to nearly saturate the excess of acid. He then proceeds to manufacture the alum in the usual way, and obtains the sulphate of magnesia by subsequently evaporating the residual liquors.

3. The patentee proposes to use magnesia obtained as aforesaid, in purifying "rough epsoms." In this case he adds a small quantity of vegetable or animal charcoal, in order to prevent the formation of ferric, or manganic acids. In other respects the process is the same as usual.

4. Another use to which the patentee applies magnesia obtained by his process, is to the purification of "rough epsoms" by calcination.

5. Another improvement consists in producing sulphate of magnesia from sulphate of iron or copperas waters. The patentee precipitates the iron from such solutions by the addition of magnesia obtained as aforesaid, obtaining the iron in the state of oxide, and the sulphate of magnesia by evaporating the remaining liquors. A small quantity of charcoal is also added in this process.

6. When manufacturing salts of soda, according to Mr. Ward's process, the patentee proposes to employ the carbonate of magnesia obtained by his process, instead of the native carbonates as claimed by Mr. Ward.

7. The patentee manufactures carbonate of magnesia by causing a stream of carbonic acid to be forced through vessels containing magnesia obtained as aforesaid, diffused through water. A bicarbonate is thus produced which enters into solution with the water, and this is consequently converted to carbonate, which is obtained as a precipitate by the application of gentle heat to the vessel containing the solution of bicarbonate.

8. The patentee proposes to employ magnesia obtained by his process in the manufacture of chloride of magnesia. The process is in other respects the same as usual.

Claims.—1. The mode described of manufacturing magnesia.

2. The means described of manufacturing salts thereof.

Improvements in the manufacture, preparation, and combination of materials or substances for the production of fuel, and for other useful purposes to which natural coal can be applied. WILLIAM PIDDING, of the Strand, gentleman. Patent dated January 24, 1852.

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The *first* part of this invention consists in manufacturing artificial fuel by combining small coal with coke, charcoal, peat, turf, brewers' grains, sawdust, roots, branches and leaves of plants, &c., or by saturating coke with a solution of nitre, or by forcing into the pores thereof oleaginous, resinous, or bituminous matters.

The *second* part of the invention consists in forcing into the pores of coke powdered coke, charcoal, or coal, then pulverising the mass after submitting it to carbonisation, and again carbonising it after compressing into moulds of the exact shape of the article to be produced. This composition may be applied to the production of building materials, to the manufacture of articles of furniture, and such articles as are usually made of stoneware or earthenware, to the manufacture of book-covers, sounding-boards for pianofortes, &c.

Claims.—1. The various modes described of treating, preparing, and combining the substances specified, and the product or products thereof—such product or products forming a new and useful species of fuel.

2. The sole use of the combinations described of certain substances with coke, producing by such combinations a material or substance applicable to many useful and ornamental purposes.

Improvements in galvano-electric, magneto electric, and electro-magnetic apparatus, and in the application thereof to lighting, telegraphic, and motive purposes. ISAAC LEWIS PULVERMACHER, of Vienna, engineer. Patent dated January 29, 1852.

Claims.—1. Certain capillary batteries, composed of several electromotor surfaces, placed at small distances from each other, and excited by the oxygen of the atmosphere, or other electro-positive or electro-negative gases, together with electro-positive or electro-negative fluids.

2. Certain hygroscopical batteries, which maintain and keep up a constant and uniform electrical excitement, from their capacity for absorbing oxygen and atmospheric moisture.

3. Several arrangements of portable capillary chain batteries.

4. A quantity changer, which allows of the quantity of electricity of any number of elements being changed into intensity, and *vice versâ*, by a single movement.

5. A clockwork apparatus for breaking and making the currents.

6. An apparatus for breaking and making electrical currents.

7. The application of the batteries described to lighting, telegraphic, and motive purposes.

8. An instrument for varying the intensity of the electrical current according to the nature of the battery producing it.

Improvements in the manufacture of pigments or paints. (A communication.) ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. Patent dated January 29, 1852.

This invention consists in partially decomposing serpentine and other similar rocks containing magnesia and oxide of iron in combination with silicic acid by the use of certain acids, so as to obtain thereby a basis which may be united with various coloring matters for the production of a new class of pigments or paints.

The following methods of preparing different colors will serve to illustrate the invention.

Blue.—The serpentine or other mineral used is to be finely powdered and placed in a suitable receptacle; then, to every 100 lbs. by weight thereof, are added 10 lbs. of prussiate of potassa dissolved in 40 lbs. of hot water. When these have been well mixed by stirring, there are added 25 lbs. of sulphuric acid diluted with 25 lbs. of water, and the mixture is again well stirred. After a short time the mass becomes converted to a fine blue pulp. About 50 lbs. of water are then added to dissolve out the soluble salts, and the mixture is allowed to remain quiescent for about 36 hours. The supernatant water is then drawn off, and the pulpy residue washed, withdrawn and dried, after which it may be used as a pigment when ground with oil, or in any other way. The water drawn off contains sulphate of magnesia, which may be obtained by evaporation.

Chrome Green.—The quantity of the blue obtained by the preceding process has mixed with it, by stirring, 5 lbs. of acetate of lead, or an equivalent quantity of another salt of lead dissolved in 20 lbs. of water. A further addition is then made of 15 lbs. of bichromate of potassa dissolved in 20 lbs. of water, after which the mass is washed and dried, and thus brought to a fit state for use.

Yellow.—To every 100 lbs. of ground rock the patentee adds 50 lbs. of acetate of lead, or an equivalent of another salt of lead, and 10 lbs. of muriatic or hydrochloric acid diluted with 40 lbs. of water. Then, after mixing the mass by repeated stirrings, he adds 50 lbs. of bichromate of potassa dissolved in 50 lbs. of water, and again stirs the mass. The precipitate re-

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sulting from this process is washed and dried as above directed.

Black.—To every 100 lbs. of rock, ground to a fine powder, the patentee adds 50 lbs. of sulphuric or other acid diluted with 50 lbs. of water. After well stirring the mass, he adds 10 lbs. of logwood, or nutgalls, or an equivalent of other substance containing tannin, boiled in 40 lbs. of water and strained, and mixes the whole carefully. The product is then washed and treated as above directed in the case of the blue color.

Claims.—1. The method of preparing the basis above mentioned by treating the natural silicates of magnesia and iron, or substances wholly or in part composed of those matters, with an acid, so as to produce partial decomposition of the same.

2. The production of a class of pigments or paints by uniting various coloring matters with a basis formed by the decomposition of the mineral serpentine, or other allied rocks which contain magnesia and iron combined with silicic acid, or of mineral substances consisting in part of the silicates of magnesia and iron.

Improvements in the locks of fire arms and cannon, and in gun matches, or in the mode of igniting gunpowder used in guns, and in machinery for manufacturing the same. JOSEPH MAXIMILIAN RITTER VON WINIWARTER, of Surrey-street, doctor of law. Patent dated January 29, 1852.

This invention consists of the following improved compositions for making gun-matches.

First Composition.

300	parts	Fulminating mercury.
288	,,	Chlorate of potassa.
312	,,	Sulphate of antimony.
60	,,	Charcoal and saltpetre (mixed in the proportions of 16·7 parts of charcoal to 63·3 parts of saltpetre).
23	,,	Ferrocyanide of potassium.
6	,,	Binoxide of lead.
900	,,	Etheroxylin (containing 75 parts of pyroxylin to 150 parts of ether).

Second Composition.

75	parts	Fulminating zinc.
4	,,	Chlorate of potassa.
7	,,	Sulphate of antimony.
15	,,	Binoxide of lead.
224	,,	Etheroxylin.
1	,,	Ferrocyanide of potassium.

Third Composition.

75	parts	Amorphous phosphorus.
64	,,	Binoxide of lead.
15	,,	Charcoal and saltpetre.
105	,,	Etheroxylin.

In preparing the above compositions the ingredients are placed in a finely-powdered state in a mixing machine, which consists of a horizontal cylinder, divided into two parts by a perforated plate, and having two pistons working in it, by which the materials are forced through the plate, first in one direction and then in the other, until thoroughly mixed. The composition is then moulded into matches of a conical shape, and of rather less diameter than an ordinary percussion cap, when dry the matches are ready for use in the same manner as caps and as substitutes for them. In order to fit gun-locks for use with such matches, the nipple has a conical recess formed in it, into which the match is introduced.

The "etheroxylin" above-mentioned is prepared by mixing one and a half parts by weight of cotton wool, paper maker's pulp, or sawdust, with a liquid composed of twelve parts by weight of sulphuric acid, of sp. gr. 1·815, and six parts of nitric acid. After remaining at rest for about six hours, the fibrous material is cleansed with water to remove the superfluous acid, and carefully dried. The product thus obtained is "pyroxylin" which is moistened with spirits of wine, according to the degree of etherization required, and when dissolved, is ready for use as above described.

Claims.—1. The several compositions in the proportions described.

2. The mixing machine having a perforated plate.

3. The mode of forming the matches.

4. The mode of preparing the etheroxylin.

Improvements in obtaining gold. WILLIAM LONGMAID, of Beaumont-square, gentleman. Patent dated January 30, 1852.

Mr. Longmaid's process for obtaining gold consists in fusing the quartz or other stony material containing the same by the addition of suitable fluxes, such as lime, fluor-spar, alkali, iron pyrites, &c., when the gold, by its gravity, is precipitated to the bottom of the melting furnace, or its separation accelerated by placing on the bed of the furnace metallic iron; pieces of old boiler plate answer for this purpose. The gold is afterwards detached from the boiler plate by immersing the same in molten lead, and may be obtained from the lead by the ordinary process of cupellation.

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PATENTS AND INVENTIONS COMPANY.

We have received a prospectus of this company, which states that it is one of the fruits of the Great Exhibition of 1851.

"In this wonderful competition, when more than 18000 Inventors, Engineers, Artists, Chemists, Agriculturists, Manufacturers, Artisans, &c., were assembled, it is painful to know that a vast amount of remarkable Inventions could not find in the Crystal Palace that position to which their excellence fully entitled them, and this arose from deficiency of means, and because there was no society then established to which they could apply for the capital requisite to bring their Inventions to perfection, and obtain for them a demand, and consequent success."

This has led to the formation of the Patents and Inventions Company, in the prospectus of which we find the names of several of the Exhibition Commissioners, and a great number of public functionaries and eminent men, whose names, indeed, ought to be a guarantee of the success of the undertaking.

The objects of this Company are:

1. To purchase the whole or a portion of any patent offered to it, after a careful investigation of its merits.
2. The sale of such patents or portions of them.
3. The carrying out of Patents for the sole profit of the Company, or in participation with the Inventors, according to arrangement.
4. The formation of Companies for working particular patents, with a share in the profits, with or without advance of money.
5. Patents will be taken out for Inventors by the Company after being most rigorously tested.

It is the intention of the Patents and Inventions Company to establish a workshop for mechanical, and a laboratory for chemical experiments, and in these the inventions submitted to the Scientific Councils, will be carefully tested.

That a company of this kind has long been wanting, every one must admit; our readers are well aware that we have long held this opinion. Several times during the last 20 years we have had hopes of seeing the want supplied, and, within the last two years, we have been led to the belief that it would be; but we have been very much misled. The Patents and Inventions Company however, seems to be a very different—a very respectable affair—and we hope it may succeed. The shareholders are under the guardianship of a set of gentlemen who will do credit to the trust reposed in them.

Even when the new Patent law comes into operation, there must be a great number of cases in which, not only from the expense of a patent, but for the sake of the searching investigation which each invention will have to undergo, it will be better for the inventor to apply to the Patents and Inventions Company for aid than to seek a private speculator; he cannot always find the latter; the former will always be ready to listen to his appeal. Indeed, the private speculator will soon find the value of the investigations of the Company, and will, doubtless, himself seek its aid.

We sincerely hope that the Patents and Inventions Company will succeed, and we think it must. It has not to contend against the disadvantages which have brought about the demise of its predecessors; it appears to have started vigorously into a healthy existence.

We are certain that Inventors may safely place the utmost confidence in the gentlemen officially connected with the Patents and Inventions Company.

We should say that as it is the only company of the kind now in existence, the absence of competition, and the certainty of doing a large business must ensure very large dividends to the shareholders.

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PHARMACY, MATERIA MEDICA, THERAPEUTICS, &c.

RESULTS OF THE EXAMINATION OF SEVERAL PARCELS OF ALEPPO SCAMMONY.

BY B. W. BULL.

SINCE the publication of an article upon Virgin Scammony in a previous number of this Journal, I have had an opportunity of examining four different varieties of scammony received from Constantinople, under the names, Aleppo Scammony, first; Aleppo Scammony, second; Tschangari Scammony and Skilip Scammony.

No. 1. *Aleppo Scammony, first.* This occurs in large amorphous pieces weighing one or more pounds; is not covered with any calcareous powder. The fractured surface presents a dark greenish resinous appearance. The specific gravity will be found below. The caseous odor is not so decided in this specimen as in some of the other varieties, confirming, as will be seen from its composition, as adduced further on, the remark made in the article above alluded to, in regard to the insecurity of relying upon the odor as a means of judging of the quality of scammony.

No. 2. *Aleppo Scammony, second.* Of this a sample of about one pound was received. This is in amorphous pieces; it differs from the previous specimen in its fracture which is non-resinous and horny, it is of a much lighter color, and has a grayish tinge. The scammony odor is more decided. This variety receives the prefix *Aleppo* improperly, as it does not come from that locality, and is said to be made by pressing the root, though the quantity of insoluble organic matter which it concontains, seems to indicate some other impurity, intentionally added.

No. 3. *Tschangari Scammony*, derives its name from the place of production. It appears to be a variety not found in market here. It resembles in fracture the last mentioned, and is like that, in amorphous pieces. Its odor is more decided than that of any of the others.

No. 4. *Skilip Scammony.* This specimen appears to have undergone some deterioration, and evinces a disposition to mould. Some of the pieces are marked exteriorly, as if placed in a bag when soft, and dried in this way. It is destitute of the caseous odor, and has a mouldy smell. Fracture, non-resinous, and grayish, like the last mentioned varieties.

These three latter varieties are always to be obtained in Constantinople, we are informed, while the first quality Aleppo, is only produced in small quantity, and is soon out of market.

The difference in composition of the different varieties will be found annexed, the numbers referring to those given above. All of them indicate the presence of starch by the test with iodine.

	No. 1.	No. 2.	No. 3.	No. 4
Specific gravity,	1·150	1·325	1·339	1.311
	Per cent.	per cent.	per cent.	per cent.
Resinous matter, water, and loss.	86·88	55·42	64·10	34·00
Vegetable substance, insoluble in ether, ...	8·10	38·00	23·17	59·43
Inorganic matter, ...	5·02	6·58	12·73	6·57
	100·000	100·000	100·000	100·000

—*New York Journal of Pharmacy*, June, 1852.

ON THREE KINDS OF QUININE.

BY J. VAN HEIJNINGEN.

If common pure quinine is dissolved in absolute alcohol and the latter allowed to evaporate spontaneously, a resinous mass remains behind, containing acicular crystals. If dissolved in ether, there also remains after the evaporation a resinous substance, but these crystals cannot be discovered in it. According to Martiny and Liebig common quinine is obtained in crystals from an ammoniacal liquid. These are most easily procured when ammonia in excess is added to a solution of the neutral sulphate of α quinine and of the sulphate of quinine with three atoms of water, and the mixture set aside. After some time very fine acicular crystals appear on the surface, which can be isolated only with difficulty, and when washed and dried form an amorphous

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powder. But from absolute alcohol this quinine like amorphous quinine will not crystallise. If, however, recently-precipitated quinine, after having been carefully washed and repeatedly moistened, is spread out as thinly as possible and exposed to the air, the amorphous precipitate is gradually converted into crystals, which can be as easily recrystallized from absolute alcohol as quinine.

This amorphous precipitate, however, which is the third hydrate of quinine, loses during crystallisation two equivalents of water and possesses now, like the first hydrate of quinine, the property of being much less soluble in spirit of wine, and of crystallising out of the hot alcoholic solution by cooling. This quinine recrystallised from alcohol and procured, as described above, by precipitation from the common sulphate of quinine by ammonia, loses, when moistened with ammonia, and exposed for a few days to the air at 266° F., five per cent. of water.

Quinine....	94.935....	1=2025.0	94.8
Water....	5.065....	1— 112.5	5.2
	100.000	2137.5	100.0

It follows, therefore, that there are three kinds of quinine quite distinct one from the other, and which show their peculiarity also in their salts namely—

α quinine, which loses at 266° F., 14.3 per cent. water = 3 eq.

ϛ quinine, which loses at 266° F., 10.8 per cent. water = 2 eq.

γ quinine, which loses at 266° F., 5.2 per cent. water — 1 eq.

The γ quinine forms like the α and ϛ quinine, basic and neutral salts, which easily crystallise, and are all very similar to those of ϛ quinine. The basic sulphate of this alkaloid contains much less water than the corresponding salt of the α and ϛ quinine.

Analysis showed

γ quinine....	84.78 —	4050.0	84.81
Sulphuric acid..	10.75 —	500.0	10.47
Water.....	4.47 —	112.5	4.71
	100.00	4662.5	100.00

The proportion of water in the corresponding sulphate of α quinine, is 14 per cent., or seven equivalents; in ϛ quinine, 12.9 per cent., or six equivalents; and in γ quinine, 4.70 per cent., or one equivalent.

The γ quinine is easily prepared, and of importance for the purification of the α quinine, as it crystallises, and can be therefore more easily purified.

It establishes, moreover, the presence of the ϛ quinine, beyond doubt, since it is now quite certain that all three will arise one from another. For the sake of greater order, the denomination should now be altered, and α quinine should be called that with one atom of water; ϛ quinine that with two atoms; and γ quinine that with three atoms of water.—*Pharm. Central Blatt.*

POISONING BY AN OYSTER.

M. Carron recently communicated to the *Academie de Medicine Pratique* a very extraordinary case of poisoning. A lady, after having eaten an oyster, almost immediately experienced a sensation of strangulation followed by vomiting. When M. Carron saw the patient, the pulse was small and frequent, the eyes injected, the lips swelled; the body was covered with urticaria and a sort of erysipelatous erythema. These symptoms yielded under a treatment consisting of enemata of assafœtida, diaphoretic draughts, cataplasm on the abdomen and sinapisms.

M. Carron enquires whether the symptoms in question were due to a peculiar disease of the oyster, or whether they were caused by this oyster having attached itself to the copper sheathing of a ship, and thus having occasioned the symptoms of copper colic.

We have studied the poisoning by oysters, and we cannot attribute the case noticed by M. Carron to the presence of copper. Indeed, it results from our experiments that 137 gr. 50 centig. of the flesh of oysters, detached from the shells, which had been adhering to the copper bottom of a ship, contained only 6 centigr. 9 milligr. of copper, although the shells of the oysters we examined were incurited with copper, and, in some parts, were penetrated by a salt of copper.—*Journal de Chimie, Mèdicale*, July, 1852.

DIGITALINE, ITS THERAPEUTICAL EFFECTS, ITS DOSE AND BEST MODE OF ADMINISTRATION.

BY MM. ANDRAL AND LEMAISTRE.

Before entering into the detail of the new experiments of MM. Andral and Lemaistre on digitaline, we will recapitulate in a few words the observations of M. Bouchardat, (See The Chemist, New Series, Vol II, 1850-51, p. 478) and the conclusions of MM. Homolle and Quevenne on the same subject. According to M. Bouchardat, digitaline represents the properties of digitalis as well as sulphate of quinine represents cinchona;

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only, its activity being very great, to be employed with safety, it must be used with prudence. It must be remembered, says he, that the effects of digitaline are not ordinarily produced at first; during the first few days, it seems sometimes as if the patient had taken nothing irritant; but suddenly, and, so to speak, without giving any warning, the effects of the substance begin to be manifested. It must be borne in mind that among the medicaments furnished by the vegetable kingdom, there are none to which the habitual system becomes less accustomed, and that there are doses which, in given conditions, cannot be exceeded without danger. We must not reckon on habitude in administering digitaline; it differs entirely in this respect from morphine, atropine &c. Digitaline has a much more sure and a much more uniform action than the other preparations of digitalis, and the security may be complete if, in employing the granules, we do not exceed the dose of five per day, that is to say, 5 milligrammes of digitaline. As to its action, it continues some time even after its administration has ceased. Thus, the minimum abatement of pulsations never corresponds, so to speak, with the period of administration of digitaline, but indeed with that of repose after the cessation of the administration of the medicament. If the doses have been exaggerated, there suddenly supervene nausea, vomiting, various derangements of the digestive apparatus, more rarely symptoms of the nervous system, a considerable diminution in the number of pulsations, unusual coldness, &c. Let us also add some of the conclusions of the report of M. Bouillaud, to the Academy of Medicine. Digitaline properly prepared represents all the therapeutical properties of digitalis.

Digitaline exerts a regulating action on the circulation and retards its movements. This essential and almost uniform action requires only small doses, (ordinarily from 2 to 5 milligrammes in 24 hours for an adult).

When the dose of 4 or 5 milligrammes in 24 hours is exceeded, digitaline exerts an emetico-cathartic action, sometimes brisk and sudden, and sometimes slow and gradual.

Digitaline in a higher dose determines a poisonous action when it is absorbed.

Compared with the powder of digitalis, which is considered the best preparation of this plant, digitaline should be preferred, since it presents greater ease in swallowing, a more certain action, and more uniform tolerance. M. Bouillaud experimented with digitaline on subjects attacked either with simple neuroses of the heart, or principally with chronic organic affections of that viscus and the aorta, or well-marked intermittent fevers, and of a hundred and fifty or two hundred patients who were subjected to treatment by digitaline, a more or less considerable reduction of the beats of the heart and arteries was proved: three patients only attacked with febrile phlegmasia made exceptions. Only M. Bouillaud differs from M. Bouchardat in that he adds that it is not in a secondary or consecutive manner that digitaline possesses the properties of relaxing and regulating the beating of the heart, but, indeed, that the effect is produced in a primary and proximate manner.

The result of the experiments of MM. Andral and Lemaistre comes in support of most of the foregoing conclusions. Thus, they have seen that digitaline acts on the circulatory system like digitalis in lowering the number of pulsations in a gradually decreasing manner, and that this action continues long after the cessation of the administration of the remedy. But it is especially in diseases of the heart that this action has been perceptible and uniform; besides the abatement in the number of pulsations, there is always a regulating action of the most beneficial kind on the arterial beats. As M. Bouchardat had noticed, it showed an evident diuretic virtue which is ordinarily manifested only on the third or fourth day of the treatment, and which remained uniformly for two or three days, and then decreased, and this diuresis was most abundant in cases of œdema of the cellular tissue, whilst in dropsies of the pleura and of the peritoneum digitaline had little or no action on the digestive tube, at least in medicinal doses, its influence was scarcely appreciable; it was more perceptible in the respiratory apparatus.

The observations of MM. Andral and Lemaistre refer to nineteen cases, namely: chronic affections of the heart, one case of albuminuria, one case of chloro-anœmia with intermittent fever, one case of acephalocyst of the pleura, two cases of pleurisy, and two cases of rheumatism.

These observers always prescribed the granules of one milligramme each of M. Quevenne; they ordinarily began with one, and sometimes two granules in the twenty-four hours; then gradually increased the dose, stopping most frequently at 4 granules, that is to say, 4 milligrammes in the 24 hours; sometimes they went as far as 6 or 7, but symptoms of poisoning appeared, and they were obliged to diminish the dose, or most frequently to suspend the

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remedy; and, like the foregoing experimenters, MM. Andral and Lemaistre remarked that we cannot reckon on the patient becoming accustomed to digitaline. Most commonly, it is on the third or fourth day of the treatment that vomiting, diarrhœa, cephalalgia, supervene, and that even when the doses have been very small, 2 or 3 granules per day; in one case, the suffering commenced the first day; but besides this there were great exceptions. Thus, some patients took with impunity 5, 6, and 7 granules, one even took for several days 10 granules in the 24 hours. The duration of the treatment was very variable—from a few days to one or two weeks; the greatest quantities of granules taken throughout the treatment were—23, 33, 44, 50 and 88 per month; in the latter case, the treatment was abandoned for a certain time.

To sum up, MM. Andral and Lemaistre think that digitaline should be administered:—

1. In chromic diseases of the heart, when the pulse is high and the circulation irregular. This substance has the property of restoring the pulse to its normal state.

2. In all cases of dropsy, arising either from disease of the heart, or from alteration of the blood, as in albuminuria, digitaline facilitates diuresis, and thus dissipates the serous infiltrations.

As to the other diseases in which it has been extolled, such as intermittent fevers, phthysis pulmonalis, nervous or chlorotic palpitations, the authors declare that they have not sufficient facts to enable them to speak positively. But, however, from the only slightly favorable results obtained in these different affections, they think that in inflammatory diseases, in intermittent fever, nervous palpitations, &c., the effect of digitaline, is very secondary, if it even exists.

As to the doses, MM. Andral and Lemaissre have always observed that with 2 or 3 granules per day, almost always very considerable effects on the circulation and on the urine are obtained, and that, when as many as 4 or 5 granules are administered, there most frequently arise symptoms which render it necessary to suspend the medicament; whence they conclude that the ordinary dose should be from 2 to 3 granules per day, and that this should be exceeded only in exceptional cases. The granule of digitaline may be substituted by tincture of digitaline containing about 3 milligrammes of digitaline in 30 drops.—*Bullétin Genéral de Thérapeutique.*

WHAT IS MONESIA?

BY E. DUPUY, PHARMACEUTIST, NEW YORK.

DORVAULT in the *Officine* gives it "as the product of a foreign bark never found in commerce, but described by Mr. Bernard Derosne, (who, according to the same authority is the only possessor of it,) as being found in voluminous thick pieces, filled with extractive. The color is dark brown, excepting the epidermis which is grayish. It contains tannin and a red coloring matter, analogous to cinchonic red, also an acrid one and salts." Virey attributed it to a *Chrysophillum;* Martens says it is the *Mohica* of the Brazilians; according to Mr. Constant Berrier, it bears in that country sundry other names: *furanhem, guaranhem, buranché,* etc. Duchesne in his *Répertoire des Plantes utiles et Vénéncuses du Globe,* and Descourtils in his *Flore médicale des Antilles* mentions the *Cainito Chrysophillum,* the bark of which is tonic, astringent and febrifuge. In examining some extract of Monesia I was struck with the striking resemblance in its properties with the extract of logwood, *(Hematoxylon Campechianum)* both possessing the same astringent sweetish taste, precipitating salts of iron, etc. Descourtils, who practiced medicine for a long time in the West India islands, says "it is recommendable in dysentery and diarrhea after the inflammatory period," and to that effect prescribes the decoction of one ounce of the wood or a drachm of the extract added to an infusion of orange tree leaves, or Cascarilla bark, per diem. Besides, Dr. Wood in the U. S. Dispensatory, mentions its frequent use in some parts of the United States, "in that relaxed condition of the bowels, which is apt to succeed to cholera infantum," and also in the same complaints as mentioned by Descourtils. Though both the decoction of the wood and the solution of the extract are officinal in our national Pharmacopeia, so far as my means of observation go, they are seldom, if ever, prescribed in New York, and yet I have repeatedly prepared solutions of the Monesia prescribed by our city practitioners. The extract of log-wood being so similar in its medicinal action, I am strongly inclined to think that it is the same substance, though perhaps obtained from other sources; and as the price of it is so much higher than that of the other, it would be desirable to obtain the results of comparative experiments made to test their relative value, and whether the extract of *Hematoxylon Campechianum* should not be prescribed as

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answering for all therapeutical purposes, the mysterious Monesia of Derosne?—*New York Journal of Pharmacy*, June, 1852.

ON THE EXAMINATION OF OINTMENTS CONTAINING OXIDE OF MERCURY.

BY M. BOBIERRE.

HAVING had occasion to examine some citrine ointments employed by a woman who was accused of illegaly practising medicine, I experienced some difficulty in ascertaining the chemical characters of the metallic substance present, in consequence of the small proportion of it contained in the ointment, and also in consequence of the ointment being very old. The following method of operating proved so successful, that I am induced to record it for the benefit of those engaged in such investigations. It serves to isolate mercury in a few minutes from its combination with oxygen and fatty acids. However small the quantity of mercury present may be, the effect is, nevertheless, distinct.

The ointment to be examined is melted by the application of a gentle heat, and a small quantity of essence of citron is then added to it. Under the well-known reducing influence of this hydro-carbon, the ointment acquires a grey color, which effect is to be promoted by agitation. After about five minutes, the ointment being still kept melted, three times its volume of ether is to be added, the whole mixed together, and then allowed to stand. The supernatant liquid is then to be decanted, and the residue washed several times with ether. The mercury left at the bottom of the vessel may now be dissolved in nitric acid, and tested with the usual reagents.—*Journal de Chimie Médicale.*

ON THE PREPARATION OF ODOFORM.

BY MM. CORNELIS AND GILLE.

ALTHOUGH several processes have been described for obtaining iodoform the following has not yet been published, and as a new fact it may aid those who engage in the investigation of this body.

Dissolve eight parts of iodide of potassium in 100 parts of spirit containing ninety per cent. of alcohol; heat the solution to from 95° to 104° Fahr., and then add, in small quantities at a time, a solution of chloride of lime (CaO, ClO+CaCl); part of the iodine will immediately be set free, and will give to the liquor a deep red color. It is to be agitated until it is nearly decolorized, and fresh portions of chloride of lime are then to be added, repeating the operation as long as the phenomena indicated continue to occur. When on the addition of the chloride the liquor ceases to become colored, it is to be allowed to cool, and in a little while a yellowish-white floculent matter will be deposited, consisting of iodoform and iodate of lime. The precipitate is to be collected and treated with boiling spirit, containing ninety per cent. of alcohol, which will dissolve the iodoform and deposit it in crystals as it cools.

The formation of this product may be represented by the following formula:—

$$2\ (C^4\ H^6\ O^2)+8\ (CaO,\ ClO+CaCl)+3\ KI=3\ (CaO,\ C^2\ HO^2)+13\ CaCl+3\ KCl+C^2\ H\ I^3+8\ HO.$$

The iodate of lime results from the decomposition of part of the hypochlorite of lime and iodide of potassium, as shown in the following formula:—

$$3\ (CaO^1\ ClO+CaCl)+\ KI=CaO,\ IO^5+GaCl+KCl.$$

The chloride of lime may be replaced, in this preparation, by chloride of potash or soda, but these latter, in addition to their higher price, have the further inconvenience of forming a greater quantity of iodate than the chloride of lime.—*Journal de Pharmacie d' Anvers.*

TO CORRESPONDENTS.

"L. F." Send your address.

"T. P." We recommend you to try the effects of cyanide of potassium.

"A. Student." Brande's Manual of Chemistry; Pereira's Materia Medica.

"Medicus." We will endeavour to obtain the information for you.

"A. C. W." We will write.

THE INDEX TO VOL. III., NEW SERIES.—We have been prevented by severe illness from preparing the Index to the Volume which the present No. completes. The Index and Title will be published with our next.

NOTICE.—*All Communications, Books for Review and Substance for Notice must be addressed* "To the Editors of THE CHEMIST, care of Messrs. Piper Brothers & Co., 23, Paternoster Row, London." *Communications for insertion must be prepaid, and sent before the 15th of each month. Letters requiring a reply in the following No. will in future be received as late as the 20th.*

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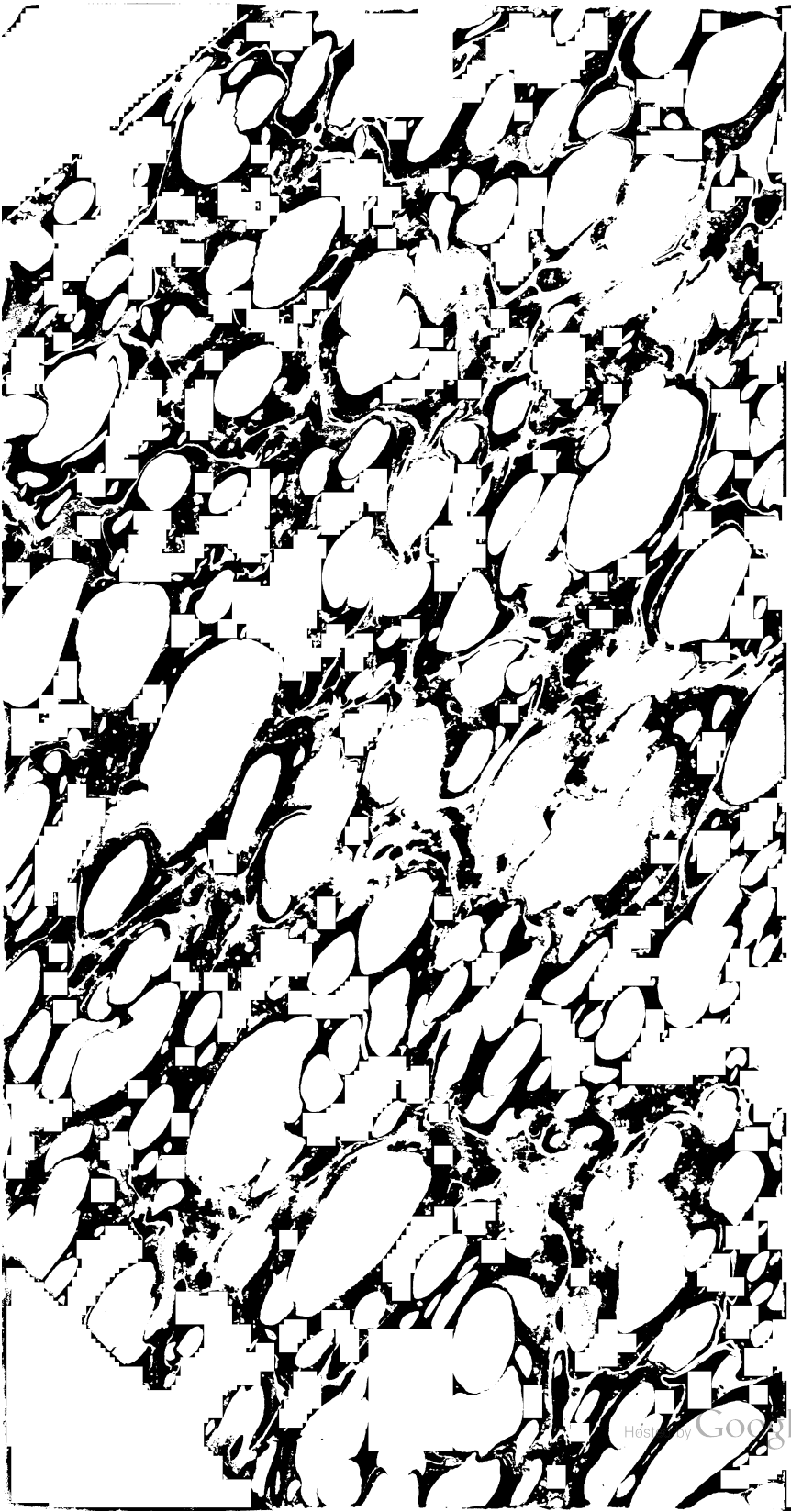
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